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First Building in the History of Expositions to be Devoted Entirely to Aeronautics.

AERONAUTICS AT THE JAMESTOWN EXPOSITION.

By Israel Ludlow, Superintendent of the Bureau of Aeronautics.

During the winter of 1906 and 1907 there was appointed through the efforts of the officials of the Jamestown Exposition an Aeronautical Committee, including government officials, members of the Aero Club of America, noted scientists and prominent sportsmen. This Committee was officially called the Jamestown Aeronautical Congress. Willis L. Moore, Chief of the United States Weather Bureau, was offered and accepted its Presidency. The Exposition officials agreed to construct and fence in an Aeronautical Concourse, to erect a special building, and to transport free of charge all exhibits to and from the Exposition Grounds; the Aeronautical Congress agreed to gather all available exhibits of balloon material, scientific instruments adapted for aeronautical purposes, balloons, airships, aeroplanes, helicopteres and orthopters, and to make such further efforts as might naturally be in the plan and scope of their organization.

A programme of aeronautical events, including balloon races, airship competitions, aeroplane and kite contests, and pigeon flights were arranged for. The Bureau of Aeronautics was created by the Exposition to correspond with the Bureaus of Yachting, Athletics, Music, etc. Owing to the exceptional inclement weather which prevailed during the Winter and early Spring and to the fact that the United States Government was very late with financial assistance which it has invariably extended of late years to international expositions, the Exposition as a

whole was in an incomplete state on its opening day, and the Aeronautical Building in particular was delayed, making it impossible to adhere strictly to the arranged programme.

The Aeronautical Concourse was dependent for gas upon a three inch main running from the City of Norfolk to the Exposition Grounds, a distance of seven and a half miles. This pipe line was not completed until early in June, and all balloon flights were postponed.

The first aeronautical event was a pigeon flight on May 9th. Five hundred and six pigeons were released for a race to Washington, D. C. It was very successful. A bright clear morning and a gentle southwest wind insured a fair race and no favor. Before leaving the Exposition Grounds the pigeons circled twice and then disappeared in the direction of their homing station. Some of the birds were not racers, and the fastest birds hung back with the slowest. The speed was about forty-five miles per hour.

A remarkable feature of this and a succeeding race to New York and Philadelphia was that the Washington pigeons flew to the west of a grand-stand that was directly north of the releasing point, and the New York and Philadelphia pigeons flew to the east of it, correctly selecting the direction for their homeward flight to an exact degree in the points of the compass, although when they passed the stand the birds were flying so low that some flew under its roof. Only half a dozen birds were nonplussed by the broad expanse of water of Hampton Roads and Chesapeake Bay and turned back. The others, without hesitancy, went on towards the points from which they were brought in closed crates in express cars.

The next event was the pigeon race of May 19th. About twenty-three hundred birds from New York and Philadelphia took part. The birds were all thoroughbreds and the race was exceptionally successful. The same favorable weather conditions prevailed and the release occupied barely four seconds from the time the lids were thrown open until the last pigeon left the crates.

Pigeon Flight at Jamestown Exposition, May 13, 1907.

The pigeon coops were arranged in a complete circle upon the backs of benches about three feet above ground. The birds, when released at 11.15 A. M., rose in a gigantic column and the sound caused by the violent beating of their wings was one not easily forgotten by those above whose heads the whirling pyramid of pigeons rose. An idea of the swiftness of their wing beat may be gained, when

it is said that cameras which were able to depict a running race horse sharp and distinct, showed but a blur of the moving wings of many of the birds. This lot of pigeons without hesitancy and without circling took a line straight to a point north by east and disappeared before the spectators could fully grasp that the event was over on the Exposition Grounds.

The birds made remarkably fast time and reached New York and Philadelphia in the early afternoon. They travelled at the rate of fifty-nine and a fraction miles per hour. The winning birds in New York district were owned by Henry Ingram of Paterson, N. J., whose pigeons arrived at 4.05.42; Paul F. Miller, Williamsburg, Brooklyn, arrived at 4.17.48; F. W. Davis, Borough of Manhattan, New York City, 4.16.52; Adolph Busch, Staten Island, New York, 4.06.49; J. W. Booth, Essex, N. J., 4.27.34; M. G. Meller, Plainfield, N. J. 4.10.04.

There was a slight superior speed in rate per mile travel by the New York over the Philadelphia birds which is believed to be due to the fact that all the pigeons followed the Atlantic sea coast line, and that the Philadelphia birds turned inward when opposite that city, while the New York birds kept on the ocean front to New York City.

There was considerable discussion among the pigeon fanciers present at the release on the Exposition Grounds as to which crates were the best, those whose tops opened upward or those whose front ends swung outward. Opening the entire top gave a quicker release, while the pigeon fanciers in favor of a front end opening claimed that in allowing the birds to rise en masse there was danger of their beating their wings against each other and fracturing a pinion. The question was not settled by the race as the point arose too late to take definite notes on the matter.

During the last week of May, Lincoln Beachey, a professional aeronaut under the management of Charles J. Strobel, made a series of dirigible balloon flights from the Aeronautical Concourse over the Exposition Grounds landing each time upon the Parade Ground. These flights were very successful and attracted wide local attention. Mr. Beachey had his airship under full control and was able to turn it within its own length. He negotiated very successfully some difficult starts and landings, handicapped by tall turrets on the Warpath and by pine trees.

Early in June, Eugene Godet, a French aeronaut also under the management of Charles J. Strobel, brought to the Exposition in bond a French airship of the latest construction and approved pattern. On the afternoon of June 7th after a day of most strenuous effort to repair a broken shaft, the airship was brought out of the Aeronautical Building in which it was housed, and the engine tested. The day had been a beautiful one, practically no breeze stirring, but late in the afternoon a wind sprang up in the eastern quarter and brought with it heavy clouds. At this time a few drops of rain were falling and the breeze was freshening every minute. It was with some trepidation that Mr. Godet's assistants saw him essay to make a flight.

There was a crowd of several thousand persons present who would have felt very much disappointed if no flight were made, and to whom an explanation that the weather conditions were unfavorable would have been highly unsatisfactory. Under these circumstances Eugene Godet determined to go up. The wind now freshened until it was blowing between 10 and 12 miles an hour. At his word "Let go" all hands released their grasp on the framework of the airship. Godet rose, advancing slowly upward, slightly against the wind, until the breeze from over the top of the building caught him, when his airship was pushed backward beyond the Aeronautical Concourse into other parts of the Exposition

Grounds. There for a few moments he again held his own, at a height probably of a hundred feet from the ground. Not being pointed directly into the wind, he drifted sidewise. When dangerously near a tall windmill near the water front, he turned his airship and presented its broadside to the full force of the wind.

With great rapidity he shot directly towards and struck two tall pine trees near the Inside Inn. The force of the wind drove his airship through the branches, breaking his propeller in two, causing the two halves to drop to the ground. His rudder also was completely wrecked, and hung downwards. Propellerless and rudderless he drifted over the roof of the Inside Inn and out over Hampton Roads. He immediately upon passing through the trees pulled his safety valve, but struck the water the first time about 500 feet from shore. He sank but a few inches and rose buoyantly, making a leap urged by the wind (which was now half a gale) of 800 feet at an elevation of approximately 20 feet, before striking the water a second time. In successive leaps, each of shorter lengths and punctuated by deeper immersions, he went over Hampton Roads toward Old Point Comfort and Fort Monroe which were about five miles distant.

Anchored in Hampton Roads was the line of battleships and many navy launches put off to the rescue, as well as row boats from the Exposition side. A launch belonging to the Battleship "Minnesota" was the first to reach the aeronaut, and its occupants grabbed the drag-rope, but were unable to tow the balloon against the wind, and the launch was dragged through the water by the airship until the airship struck the Battleship Alabama. At this time it was surrounded by six launches. Godet was in no danger,—he refused to desert his ship and remained in the framework until hauled upon the foredeck of the battleship, where the gas envelope was deflated. It was packed and returned to the Exposition Grounds by the launch. The framework was so wrecked that a new one has been constructed.

On June 8th, dedication exercises were held in the Aeronautical Building. Robert H. Sexton, Chief of the Department of Congress and Special Events, Augustus Post, Chairman of the Executive Committee of the Jamestown Aeronautical Congress; Harry St. George Tucker, President of the Jamestown Exposition; Admiral C. M. Chester of the U. S. Navy and myself were the speakers. Admiral Chester's speech was especially noteworthy being devoted to the advocacy of the aeroplane as an engine of warfare. He laid especially stress upon the possibilities of the Jamestown Exposition. He stated "that the U. S. Government would look to private experimenters for the practical solution of the problem of aerial locomotion, and that he hoped that the Exposition at Jamestown in bringing together the models and ideas of many inventors, would be of great value to the science, and that the effort of the Jamestown officials deserve the enthusiastic co-operation of all interested in aerial navigation.

Numerous exhibits are now installed in the building and in addition construction work on airships, aeroplanes and balloons will be carried on steadily during the time of the Exposition. There are now two airships and an aeroplane being built. The postponed balloon competition will be carried out if possible. The gas-pipe line has been tested, and has been found capable of delivering seven thousand five hundred cubic feet of gas per hour. Great interest is evinced in the aeroplane contest on September 14th for the Scientific American Cup of one thousand dollars, and in the kite contest in the latter part of October for the Octave Chanute trophies. Eugene Godet will make daily ascensions, (weather permitting) during the months of July and August in his airship which has been completely repaired.

Jamestown Exposition—Aeronautic Building on Right.

CONDITIONS OF SUCCESS WITH FLYING MACHINES.

By O. Chanute.

Fascinated by the now acknowledged success of the Wright brothers in America, and tempted by the facilities which light motors, so recently developed, offer for rising on the air, some 30 or 40 European aviators have built or are building, "de toutes pieces," motor-equipped flying machines on wheels, in the hope of speedily accomplishing mechanical flight. Thus far (June, 1907), they have been unsuccessful. They have made some fairly long jumps with their wheeled grasshoppers, but nothing like continuous flight has been accomplished.

It is believed that these aviators are beginning at the wrong end and taking the longest path to success. They will meet continued mishaps and some of them may get hurt. Paradoxical as it may seem it is necessary to know how to use a flying machine before trusting oneself to really fly with it. Assuming that all the other prerequisites mentioned below have been complied with, it is yet indispensable that the machine shall possess equilibrium in the air under all circumstances and turmoils of the wind, and that the operator shall know how to manage it.

Those other prerequisites which should govern the design are the following:

1st. *Ability to steer,* both horizontally and vertically. Without this ability disaster is sure to follow.

2d. *Adequate amount and shape of sustaining surface.* Some of the European machines are loaded to 3½ to 4½ pounds to the square foot, thus requiring high speeds for support. For a beginning it is not advisable to load the machines more than 1½ to 2 pounds per square foot. As to the shapes, both in plan and in cross section, it is advisable to seek for those surfaces which afford the greatest "lift" in proportion to the "drift," provided they are stable. This will best be developed by laboratory experiments, which seem to have been neglected.

3d. *Least possible resistance of framing and hull.* Very little consideration has been given to this: Notably by Santos-Dumont, in whose apparatus the head resistance must have been five or six times the drift, thus requiring much power. Col. Renard once figured out that for best results the head resistance should be equal to the drift and that the *work done* was a minimum when the

resistance of the drift was equal to three times the resistance of the hull.

4th. *Lightest possible motor in proportion to its weight.* This is obvious enough. Gasoline motors have now been reduced to a weight of 4 or 5 pounds per horse power.

5th. *Best efficiency of propeller.* Much remains to be found out. The controversy between adherents of the beating wing and of the screw propeller is still unsettled. The best forms of the latter are not determined. It is a subject for laboratory experiments.

6th. *Equilibrium.* Equilibrium has at last been recognized as the most important condition to fulfill. It is possible to develop a flying machine which shall be automatically stable in the air; which will right itself up in every wind gust, if there is enough height or space to do so before it comes down to the ground, but such a machine is not yet known. With the small leaps of the motor-driven machine there is no room to operate an automatic stability device. It is true that those short leaps are an element of safety to the operator. He cannot fall far and is in small danger of personal injury, but the machine is nearly sure to be broken in coming down at each test and this costs time and money for repairs. It is very probable that the present motor-equipped machines about to be tried will give unsatisfactory results, simply because the men who are testing them have had no previous experience in handling such an apparatus in the air. This it is that defeated some years ago the efforts of Maxim, Ader, Langley, Kress and others, who had nevertheless produced intelligent designs. This brings us to the last condition to be fulfilled.

7th. *Learning how to fly.* There is a way, practiced by all little birds, in which the use of a flying machine may be learned. It is to begin by gliding. The fledgeling tumbles out of the nest, he flutters desperately, he generally loses his equilibrium and then he glides down with seldom serious hurt. The parent bird then helps him back from branch to branch and teaches him the use of his wings. Captain Ferber recently published in "Omnia" an amusing account of a vulture who was taught first to glide and then to fly by a man.

Something analogous will have to be done by aviators. This is preferably accomplished by first building a gliding machine of the type which is intended for the flying machine and testing it personally on a sandy hillside to develop its defects in stability and to learn its control. This was the course recommended to the French aviators by myself in a paper published in "Aerophile" for August, 1903. At first they accepted the advice and made a lot of gliding experiments with moderate success, on the sand hills near Berck, but they became impatient at the slow progress accomplished, tried other methods, such as going up as a kite towed by a launch, and then they were tempted by the light motors to "get ahead of the Wrights," oblivious to the fact that the latter had spent three years in gliding before they ventured to put on a motor. Now, M. Leon Delagrange, after making quite a number of short flights (the longest about 200 feet) with his motor flying machine, has found it advisable to go with M. Voisin, the cleverest of the French flying machine pilots, to experiment with a gliding apparatus on the sand hills near Le Touquet.

The mode of conducting such experiments has been described by the various experimenters. It consists in first testing the apparatus as a kite and measuring accurately the "lift," the "drift," the "head resistance" and the location of the "centre of pressure" at various angles of incidence. If the relations between these conditions prove unsatisfactory they can be altered by changing the cross section by trussing the ribs. Then glides can be made by running and jumping into a

head wind, noting carefully the angle of descent, which should be finally as flat as possible with adequate stability.

It is great sport; the chances of accident are not great to careful men who proceed step by step, and it enables the aviator to develop gradually the best shapes of surfaces and framing for his particular design; while, more important than all, it gives him experience and skill to manage his motor flying machine when he finally comes to the point of testing it.

THEORY OF BALLOON LEAKAGE.

By A. F. Zahm, Ph. D.

In order to compute the rate of leakage of gas through the envelope of a balloon under given conditions, it is well first to derive a rational formula, then to determine the physical constants of the formula by direct experimentation. An attempt is here made to derive a suitable formula, based upon well established laws governing the motion of fluids.

The leakage through the canvas at any point of the balloon envelope is due to two causes; viz., to the internal pressure at the point and to the osmotic diffusion which may prevail there independently of the pressure. By summing these over the entire envelope an expression is found for the total leakage.

Suppose that, owing to osmotic diffusion a units of mass of gas creep through a square unit of the canvas per unit of time under no internal pressure. Then the entire leakage all over the balloon, per unit of time, due to osmosis, may be represented by the formula:

$$L_1 = a\,S$$

where S represents the surface of the envelope.

Again suppose that b units of mass of the gas permeate a square unit of the canvas per unit of time under one unit of pressure. Then under p units of pressure the leakage will be $\sqrt{p}$ times as great, since the flow of a gas through an orifice is approximately proportional to the square root of the pressure, for the conditions here considered. Hence the entire leakage all over the balloon per unit of time, due to internal pressure, is given by the formula:

$$L_2 = b \int p^{\frac{1}{2}}\, dS$$

which can be integrated when the buoyancy of the gas and form of the surface are given.

The total leakage of gas per unit of time over the entire envelope of the balloon due to osmosis and pressure combined, being the sum of the above terms may therefore be written:

$$L = a\,S + b \int p^{\frac{1}{2}}\, dS \text{.........................(A)}$$

which is the general formula sought for the mass rate of leakage, and is applicable to a balloon of any shape.

In order to render this general expression more convenient in practice, let us adapt the integral term to some common forms of balloons. And first suppose that the balloon is a surface of revolution about a vertical axis.

If the bottom point of the balloon axis be taken as origin, and y be the vertical distance to any level plane section, the buoyant pressure all over this section may be written:

$$p = p_0 + \gamma y$$

in which p_0 is the pressure at the bottom of the balloon and γ is the buoyancy of a cubic unit of the gas. Also if dS be the area of an elementary horizontal belt, or zone, of the surface, of radius x, and width ds, it may be written:

$$dS = 2 \pi x \, ds$$

in which ds is an element of the generating curve. Substituting these values of the pressure and surface in the general leakage formula it becomes:

$$L = a S + 2 \pi b \int (p_0 + \gamma y)^{\frac{1}{2}} x \, ds$$

which is applicable to a vertical surface of revolution whose contour is given.

If the balloon be of spherical form the value of L is still more simple, for we may in that case write:

$$dS = 2 \pi r \, d y$$

in which r is the radius of the surface. Substituting this value of dS, and the above value of p, the general leakage formula becomes:

$$L = a S + 2 \pi b r \int (p_0 + \gamma y) \, d y$$

which is the general formula for the mass rate of leakage of a spherical balloon inflated under pressure.

In case the bottom of the balloon, supposed full of gas, is left open, $p_0 = o$ and the formula becomes:

$$L = 4 \pi a r^2 + \tfrac{8}{3}\sqrt{2} \, \pi b \gamma^{\frac{1}{2}} r^{\frac{5}{2}}$$

which is applicable to the ordinary free or captive balloon.

In computing the leakage of small balloons inflated under considerable pressure, such as rubber balloons, the buoyant pressure may be neglected and the formula becomes:

$$L = 4 \pi a r^2 + 4 \pi b r^2 p^{\frac{1}{2}}$$

or

$$L = (a + b\sqrt{p}) S$$

In order that the various formulae here derived may be practically available for computation it is necessary that the physical constants a and b be determined by direct experiment for the diverse gases and fabrics under suitable conditions.

By a proper arrangement of the apparatus, the results of experiment can be very simply expressed by means of formula (A). If the gas under constant pressure p, be made to pass through a level aperture of one square foot area S, covered with the fabric to be tested, and if the mass leakage per unit time L, be observed, the relations between the leakage and pressure will be given by formula (A) as follows:

$$L = a + b\sqrt{p}$$

in which L and p are the values observed and a, b the physical constants to be determined for the given gas and fabric.

A convenient way to exhibit the results would be to plot L and $\sqrt{p}$ on plane section paper, thus obtaining a straight line for a diagram. A more convenient way still, would be to plot L and p directly on logarithmic paper, thus obviating the work of extracting the square roots, and still obtaining a rectilinear diagram.

The advantage of having a working formula was suggested to me by a conversation with Captain Chandler who has in hand some experiments for the U. S. War Department to determine the leakage coefficient for various balloon fabrics.

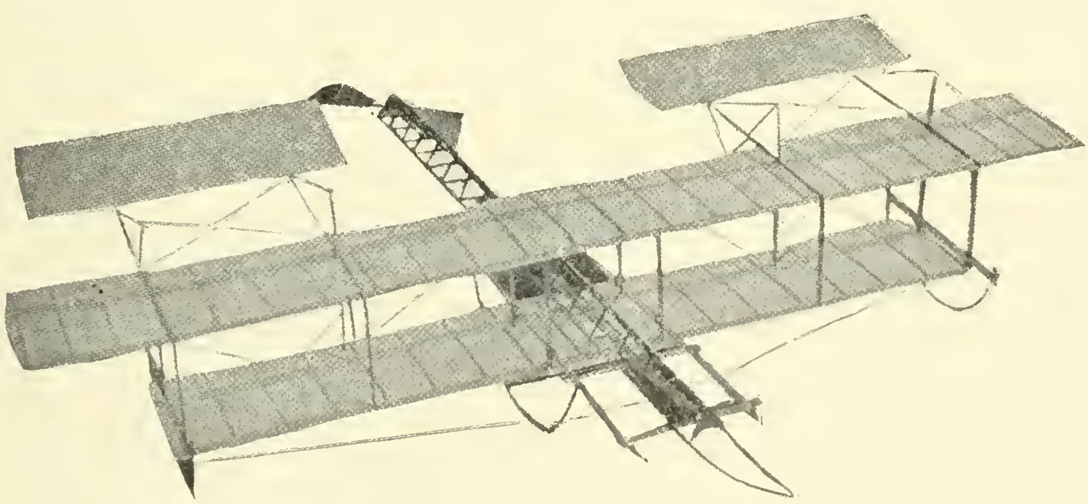
April, 1907.

ENGLISH AERO CLUB EXHIBITION.

By Wilbur R. Kimball.

If such a thing were necessary, the study of aeronautics in England certainly had a stimulus at the Aero Club Exhibition and Contest in April. The exhibition at Agricultural Hall from the 6th to the 13th, followed by the competitive tests at Alexandra Palace on the 15th, was a natural sequence of events tending to stimulate interest in this subject to the utmost. While there was considerable space given up to balloons and their accessories at the exhibition, the fact that the display of aeroplanes and flying machines proper occupied some eighty-seven stands is sufficient guarantee of the comprehensiveness of the exhibit and of the trend of thought of a large number of inventors.

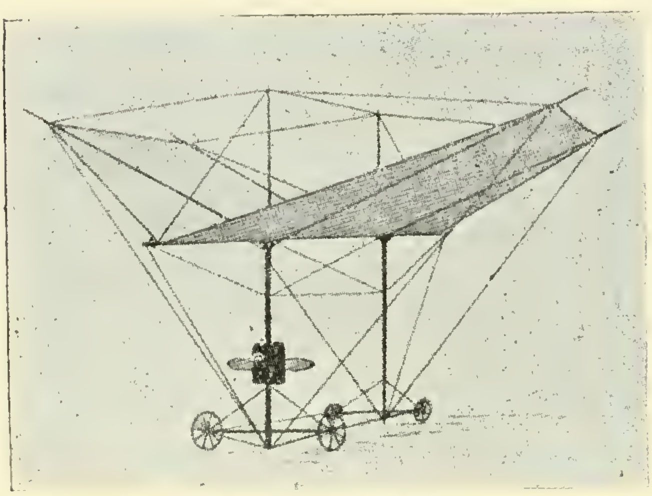
Although many of these models exhibited an utter lack of knowledge of fundamental principles, yet there were a considerable number that appealed to the better judgment and by actual test demonstrated a considerable measure of practicability. Most experimenters with kite-flying are aware that nearly any shaped surface or combination of surfaces that do not form a wedge can be raised and held in the air by a flying line, and, conversely, a wide variety of surfaces can be driven in the air in such a manner as to maintain the apparatus in the air, but with wide variations in necessary steadiness, speed and efficiency of motive power. Those machines which carried themselves to the best advantage were undoubtedly of the type with which has been associated the names of the Wright Brothers, Herring, Chanute and others still earlier, namely, a single section of the familiar box kite with variations in the controlling devices and curvature of the surfaces.



A. V. Roe's Model

At the morning contest in Central Hall of the Alexandra Palace, it was estimated that a thousand people were in attendance. There were twenty-nine entries and fifteen competitors for prizes. Undoubtedly the decided increase over previous exhibitions in the size of the models was due to the stipulation that to be eligible for entry the model must weigh not less than two pounds, nor more than fifty pounds. The prizes offered by the club were \$750, \$375 and \$100, respectively, with a condition that the models must fly at least fifty feet starting from an altitude of not more than five feet. The first prize was not awarded and will be held as a fund for use in future competitions. The

second fell to A. V. Roe and the third to W. F. Howard. The judges were Professors Huntington and Wayneforth, Col. Capper, Roger Wallace and P. Y. Alexander. Mr. Roe's winning model was of two superposed planes, driven at the rear by a single propeller. The motive power was twisted rubber mounted in a long triangular framework extended well in front. Indoors it flew a distance of about eighty feet at a height of about a foot above the floor, not doing quite as well at the outdoor contest in the afternoon. Mr. Howard's machine was a single plane bent at its longitudinal diagonal so as to form a dihedral angle. It was of very light kite-like construction with a small clockwork spring motive which drove one small propeller at the front. A considerable number of trials were made, the majority being satisfactory. Contrary to the Roe model, it made its longest flights in the open of something over a hundred feet against seventy-five feet at the morning trials.


W. F. Howard's Model.

Of the other models exhibited and tried, a number deserve more than passing mention. Judging from the number of designs of each, the relative importance of the aeroplane, the flapping wing machine and the helicopter or direct lift machine are favorites in the order named. While the last undoubtedly consumes more power in overcoming inertia at the start, this excess of power becomes available for increased speed when the machine is under way. In regard to flapping wing machines it has always seemed to the writer that, as in other mechanical movements, a reciprocating movement should always be replaced by a rotary motion where possible.

The action of some of the models was erratic and disappointing in the extreme, owing to the rapid deterioration and changing conditions of the twisted rubber used as a motive power, a fact which explains why models which had probably been carefully adjusted for the contest a few hours before caused their owners dismay by their antics at the public demonstration. Rubber ages very rapidly when under strain or even exposed to light and heat and as practically any small model has a "critical speed" necessary for complete equilibrium, slight variations are likely to cause disastrous results.

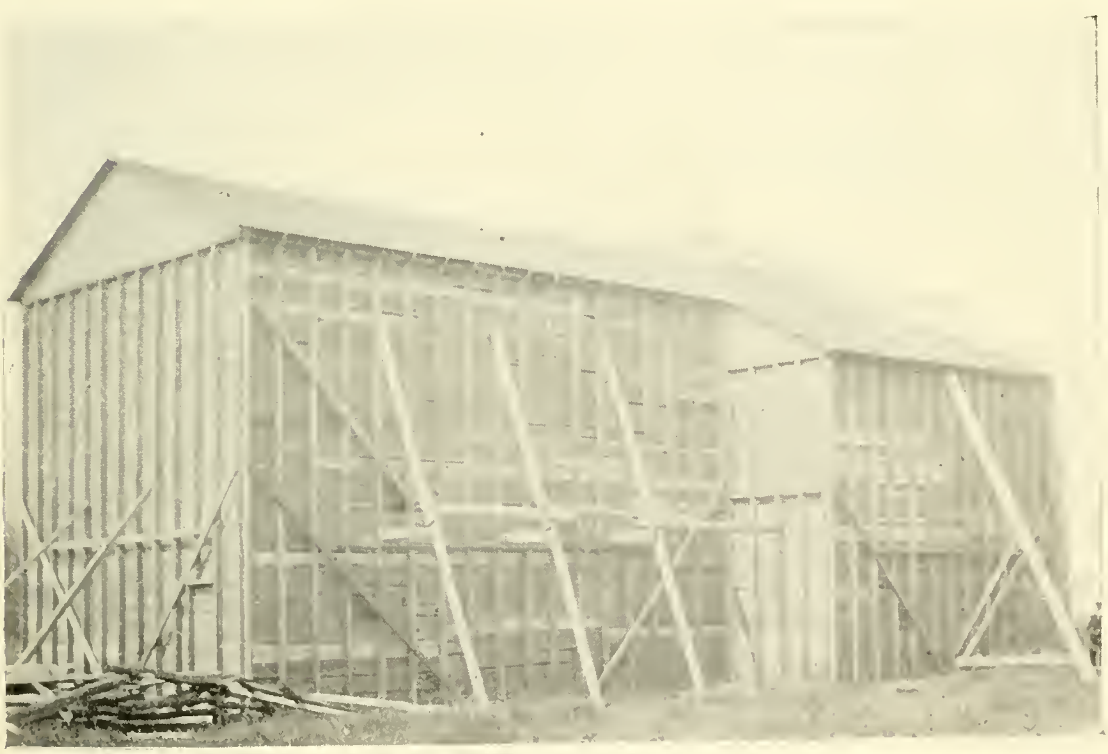
Of the fifteen competitors, seven made their machines cover a greater or less distance in free flight. Of these, five used twisted rubber, one a clock spring and one a rocket. One or two small petrol motors were attached to models but these developed troubles too serious to be overcome in time for a demonstration. This is to be regretted in one case in particular, that of the Chubb helicopter, as the design and workmanship merited recognition. In this machine two screws were mounted on vertical shafts, one inside the other, with a transmission system that permitted them revolving in opposite directions. A vertical rudder was provided for maintaining a given course, and a bowsprit projecting in front for a counterbalancing weight to compensate for the shifting of the centre of air pressure ahead of the centre of gravity. There

is probably no surer mark of correct design in small models than the provision for such an adjustment. With one exception, all of the successful machines were launched from the hand, thus furnishing the power necessary for acceleration without drawing upon the slender store of power until the flight was fairly under way. The exception was the Balston machine, a kite-like structure of two superimposed aero-curves on each side of a central bamboo framework containing the motive power driving a propeller in the rear. Twisted rubber was the power. It lifted itself clear of the floor and covered about 12 feet in the air. The distance flown by a small model is the least significant of any feature, providing this be long enough to make sufficient observation of its equilibrium and afford an approximate estimate of the power absorbed.

It is more than probable that there was not sufficient inducement in the prizes offered to bring out the best designed machines and that more than one "dark horse" is in position to bring out a man-carrying device when the psychological moment arrives.

FIRST PRIVATE AERODROME IN AMERICA.

The illustration is that of the aerodrome of G. H. Curtiss at Hammondsport, N. Y. This has been built in response to a need for a large building in which



G. H. Curtiss' Aerodrome.

to continue his experiments and is the first one to be built solely for private use. Captain Baldwin has been using it during the past Winter in making some radical alterations in his airship. The building measures 40 by 75 feet, and is 27 feet high.

THE METEOROLOGICAL CONDITIONS ABOVE SAINT LOUIS.

By Professor A. L. Rotch,

Director of the Blue Hill Meteorological Observatory.

In the circular letter from the president of the Aero Club of America concerning the next Gordon-Bennett balloon race, it is said that the observations of the Weather Bureau with kites and pilot-balloons at St. Louis show that the upper air moves towards the east. While, of course, this has long been known from the observations of the drift of the upper clouds, I desire to point out that our government Weather Bureau has made no observations with pilot-balloons at St. Louis and that the observations quoted are those obtained by this Observatory. With the co-operation of the St. Louis Exposition, the first registering balloons in America were liberated from St. Louis during the autumn of 1904 by my assistants, Messrs. Clayton and Fergusson, and the experiments have been continued at my expense and with aid of the Smithsonian Institution during the past two years at different seasons. As the observations obtained have a special interest in view of the selection of St. Louis as a starting point for the international balloon race next October, I give some facts which may be useful to intending competitors.

The balloons used in my experiments were the rubber balloons of Prof. Dr. Assmann, which are well known in Europe. Each balloon was filled with hydrogen gas and carried a self-recording barometer and thermometer, constructed on Teissererenc de Bort's system, which a parachute covering the upper portion of the balloon brought safely to the ground after the balloon had burst on reaching the maximum height commensurate with its expansion. 56 of these balloons were sent up during the years 1904, 1905 and 1906, and, by remarkable good fortune, 53 balloons with their instruments were found and returned to this Observatory on payment of a small reward to the finders. The records of barometric-pressure and temperature were usually decipherable and from the automatically recorded times of the ascent of the balloon at St. Louis and its descent at a place whose distance and direction from St. Louis are known, the average direction and velocity of its drift can be calculated.

Classifying according to altitude all the ascensions at different seasons of the year, I have obtained the figures for the movement of the air at different heights above St. Louis, which are embodied in the accompanying table. No. 1 embraces the balloons whose maximum height was less than 16,000 feet, No. 2 those in which the maximum height was between 16,000 and 33,000 feet, No. 3 those between 33,000 and 49,000 feet, and No. 4 those of 49,000 or higher.

Level	No. of Ascensions	Mean Max. Altitude (Feet)	Mean Altitude (Feet)	Mean Distance Travelled (Miles)	Mean Velocity (Miles per hr.)	Mean Direction from St. L.
4	9	52,500	26,000	117	47	S. 81° E.
3	16	40,500	20,000	155	56	S. 85° E.
2	13	23,500	12,000	101	38	S. 87° E.
1	8	11,500	6,000	42	25	S. 79° E.

It will be seen that the velocity, and consequently the distance travelled increases up to the third level, above which there is a slight decrease, and that the lowest balloons took the most southerly course (S. 79° E.) while the level 2 balloons

went nearly due east (S. 87° E.). Naturally, there were great individual differences in velocity and direction. Thus, in level 1, which will hardly be exceeded by the racing balloons next October, one balloon on Nov. 23, 1904, which reached a height of 7,600 feet, travelled 55 miles at an average velocity of 51 miles an hour, while the next day another balloon at a slightly greater height followed the same course but went 90 miles further. The minimum velocity was shown by a balloon on May 17, 1906, which, though it rose to a height of 14,700 feet, travelled only 15 miles northeast at an average speed of only 11 miles an hour. It appears probable, however, that the balloons which compete in the International Cup Race will travel at the rate of about 25 miles an hour towards a point slightly south of east, the distance, of course, depending upon the length of time that the balloons can keep afloat. In level 3 two balloons in November, 1904, which reached heights of about seven miles travelled at an average speed of 100 miles an hour, one 280 miles east, the other 255 miles south southeast. As this is the average velocity in the upper and lower air strata, the velocity at the maximum altitude in both cases probably much exceeded 100 miles an hour, but such velocities are shown by the measurements of the drift of cirrus clouds at Blue Hill to be not unusual in winter over the United States. Assuming that the mean temperature for October at St. Louis is 59° F., the temperature at two miles will be about 35° F. and at four miles about 15° F. Though far beyond the reach of the manned balloons, it may be interesting to state that in January, 1905, at a height of about nine miles,—110° F. was recorded by one of the balloons, which is among the lowest natural temperatures ever observed, and that the following July—75° F. was registered at a height of less than nine miles.

FIRST NATIONAL BALLOON RACE IN AMERICA.

A national balloon contest between amateurs for distance will be held at Providence, R. I., Wednesday, July 31, 1907, or the first favorable day thereafter, in connection with "Old Home Week," a typical New England custom of having at more or less frequent periods a reunion of former and present residents. This occasion is the first that Providence has had.

A gasometer of 500,000 cubic feet will supply pure coal gas of .43-.44 specific gravity through a 12 inch pipe direct to the grounds. At least six balloons are expected to compete and arrangements will be such that these can be filled simultaneously in one hour.

The race will start from a ten acre level field near the Pawtucket gas works, just out of Providence. There is a magnificent automobile speedway through Blackstone and Swan Point Park, and several trolley lines, direct to the grounds, adjoining Riverside Cemetery on the north, less than three miles from the State capitol, center of Providence.

Gas will be furnished free to contestants, their transportation and that of their balloons will be paid and they will be guests of the city during their stay

Three silver cups will be offered to the entrants making the three longest trips. Another cup will be offered to the first automobile or motorcycle to come up with any balloon at its point of descent, provided such arrival is within thirty minutes of the time of the balloon's landing.

Capt. Thomas S. Baldwin is expected to make some demonstrations with his new dirigible "20th Century," the largest and most powerful in this country.

The committee in charge of this event is E. L. Jones and A. L. Stevens. Entries are requested to be sent in at the earliest moment, addressed to E. L. Jones, Chairman, 142 West 65th St., New York.

Entries close July 15th.

THE AERO CLUB OF PHILADELPHIA.

By Joseph Jackson.

If one were to look for the genesis of the Aero Club of Philadelphia, he would find it in the first aerial voyage of its president, Mr. Alfred N. Chandler. The quiet, unostentatious trip made by Mr. Chandler in the Spring of 1906 passed off with so much satisfaction that immediately some of his friends and acquaintances became enthusiastic in their admiration of the sport and the organization of the first balloon club in Philadelphia, and the second one in America, quickly followed as a natural consequence.

Mr. Chandler had been widely known as a yachtsman and automobilist, being a member of the Corinthian Yacht Club and owner of the schooner-yacht "Vigil" which for two years won every race in the yacht club cruises. He was also recognized as one prominently identified with gentlemanly sports, including automobiling, being now president of the Automobile Club of Philadelphia; but when it became known that he had purchased a balloon and proposed to make an ascent it created great public commotion and there were some who ventured to persuade him to change his mind. This was owing to a popular misconception of the dangers of ballooning. It is extremely difficult to persuade most persons that a balloon voyage is not necessarily dangerous. The success of Mr. Chandler's first trip, if it had any far reaching effect, convinced many who previously were sceptical, that a trip through the air, under proper auspices and circumstances, may not only be entirely safe but positively beneficial.

On May 12th, 1906, Mr. Chandler, accompanied by Henry S. Gratz and Charles Levee, a pilot of the Aero Club of France, started from the Athletic Grounds, adjoining the gas works, at Point Breeze. Mr. Chandler used his own balloon Initial, and, consequently, was the first amateur in this country to ascend in his own aerostat. In Europe this is so common as not to call for comment, but in this country the introduction of a private balloon was so unusual as to excite attention. Having been elected a member of the Aero Club of America and of the Aero Club of France, this pioneer aeronaut decided that membership in these organizations was an empty honor if one did not become an active aerial navigator. With this idea in view and with a belief that he would be assisting to make the sport popular among sportsmen, he started off in the Initial from Point Breeze that May afternoon.

As this ascent is in a measure historic, it may be permissible to record that the start was made at 1.15 P. M. in the presence of a large throng, in which was Samuel A. King and A. Leo Stevens, professional balloonists. The aerostat has a capacity of 35,000 cubic feet. The descent was made at South Amboy, at 2.50 P. M. The distance travelled was about 70 miles, and the greatest altitude reached was 3000 feet.

The greatest enthusiasm on the part of clubmen followed this attempt to bring ballooning into the circle of sports in this country, and the next day there was considerable talk of forming an aero club in this city. The fact that ballooning could be done safely, as evinced by Mr. Chandler's experience, gave immense impetus to the movement, and, on May 24th, there was held at the Racquet Club, a meeting attended by about twenty enthusiasts.

A permanent organization was subsequently formed. Alfred N. Chandler was elected President; Henry S. Gratz, First Vice President; Dr. T. Chalmers Fulton, Second Vice President; E. A. Custer, Secretary; and Dr. P. B. Thatcher, Rev.

Dr. George S. Gassner, F. L. Richardson, and Dr. Samuel J. Ottinger, Directors.

The first ascent under the auspices of the club was made on May 26th, two days after the preliminary meeting. Arrangements had been made for a race. The balloons, "Initial," owned by Mr. Chandler, and "l'Orient," belonging to the Aero Club of America, were to start with Mr. Chandler in his aerostat, Mr. Levee, pilot; and Mr. Gratz in "l'Orient," with Mr. Stevens, pilot. Each was also to carry a newspaper man to report the race. The wind, however, was blowing too strong, and there being great danger of fouling in getting off, only the Initial, in charge of Mr. Levee, and carrying two newspaper men, was released at 2.33 P. M. and was soon speeding northeast in a 22-knot breeze. At 3.45 P. M. the balloon descended on a farm near Newtown, about 23 miles from the starting point. On this occasion there was flown to the breezes the first aero club pennant to make its appearance in this country. The colors being blue, gold and blue.

On July 26th, 1906, the first scientific experiment undertaken by the club was made. On this date Drs. Fulton and Ottinger in the balloon l'Orient, which is a bag of 35,000 cubic feet gas capacity, made an ascent from Point Breeze, where all the ascents of the club are made, owing to the proximity of the gas works. Although the ascension was superintended by the veteran aeronaut, Samuel A. King, Drs. Fulton and Ottinger having had past experience, went up without a professional pilot. In several particulars this was one of the most remarkable ascents ever made in this city. An altitude of over 20,000 feet, or nearly four miles, was reached, and that great height was arrived at while the aerostat drifted only about ten miles. The start was made at 2.18 P. M. and the descent near Media, about 7.30 o'clock.

Drs. Fulton and Ottinger were trying for height and not long distance. They made a new record for altitude in this neighborhood, and also were able to conduct a number of important experiments in connection with aerotherapy. For sometime what has been named aerotherapy has been recognized by European physicians as a great agency in the treatment of diseases of the respiratory tract and of the circulation, and it was possible during this voyage to carefully investigate this department of medical knowledge.

Two other ascents were made under the club's auspices in the year 1906. On one of these trips, Dr. Ottinger had for companion, Mr. Henry S. Gratz, and on the other, Mr. Alfred T. Atherholt.

The last trip was made on October 6th, when Mr. Atherholt accompanied Dr. Ottinger. The balloon used was Mr. Chandler's aerostat Initial. The aerial voyagers had the most exciting trip in their lives. For six hours they were in the midst of a hurricane, they encountered an aerial thunder storm, nearly descended into a lake, and, altogether, saw something of the seamy side of ballooning but made a safe landing. They left Point Breeze at 12.20 P. M., met a hurricane at Mt. Pocono, at 2.30, and landed at Rockaway, near Passaic, New Jersey, at 5 o'clock. In all, 233 miles had been covered in 385 minutes.

Another memorable trip under the club's auspices, was made by Mr. Chandler. This was on March 23rd, of this year, the only voyage, so far undertaken this season. The balloon Initial was used, and Mr. Alan R. Hawley, member of the Aero Club of America, went along as amateur pilot. Mr. Hawley, it might be mentioned, was qualifying as pilot for the International Race to be held in St. Louis this Summer. The start was made at 12.25 P. M., and as the wind was almost direct east, the trip ended on the Atlantic City meadows, where a landing was made at 3.10 P. M. An attempt was made to reach the sand beach at Atlantic City, but a repelling sea breeze near the surface prevented further progress in that direction. During the voyage, an altitude of 7,000 feet was reached, which

was attained immediately before landing, the descent from that altitude being made in 7½ minutes.

This trip showed conclusively that Philadelphia is favorably situated for starting with a balloon, for if the wind is blowing from any direction excepting the west, a fairly long voyage is possible. At present several members of the club are building a monster balloon, the Ben Franklin, which is to have a capacity of 92,000 cubic feet.

AEROMOBILES SOON TO BE ON THE MARKET.

The Vacu-Aerial Navigation and Manufacturing Co. of America has been for some time working on a machine which they believe to be about perfected. In an interview with Dr. A. Rudolph Silverston, the General Manager, he said:

"I expect to begin experimenting with a finished machine between the first and the fourth of July. If we do not have any breakdown we possibly will give a demonstration July fourth.

"There are only a few words that I can say at the present time regarding the machine, and they are more than we have said to anybody else. The principal part of our machine consists of a tubular body made entirely of aluminum, 25 feet long and 8 feet 3 inches in diameter. We have two sets of planes, each one 60 by 6 feet. Including the tubular body, we have a plane surface of nearly 1400 square feet. As far as indications now go, our weight will not exceed, including machinery and car, which is below the tubular body, 800 pounds. The horse-power is supplied by a Curtiss motor, and is the same motor used by Mr. Curtiss at Ormond Beach last January or February, which made the fastest mile ever travelled in the world, namely, a mile in 26 2-5 seconds, or 139 miles an hour. The motor is guaranteed to furnish 40 horse-power, but easily develops between 60 and 65. The upper plane surface on our machine insures a perfect maintenance, automatically, of equilibrium in both directions. As far as models have shown, we can rise almost instantly from the ground and descend with equal facility and safety. You will observe that we carry about ½ pound to the square foot of surface. We have employed nothing else but aluminum and steel, except for the wing surface, where we naturally used oiled Japanese silk. Comparing our machine, taking into consideration the horse-power, plane surface and weight, with the apparatus of the Wright Brothers and of Santos-Dumont, we should be able to carry from 2000 to 3000 pounds.

"We have absolute confidence in out-doing any machine so far put before the public and have no hesitancy in saying that we have in this production actually solved this vexing problem. From what we know from model flights, we can travel in any desired direction under any and all conditions in absolute safety, and in that regard, far superior to any automobile or steamboat. We are employing a number of patent devices to secure safety to the operator and passengers. I lay stress on passengers because if we have only a pretty toy, and are incapable of reducing this invention to a commercial basis why, then we quit. Our aim and intentions are centered entirely on a commercial solution. If this machine proves what we claim, we will at once engage in the actual manufacture of this machine, with many new devices attached, and we have gone so far already as to locate a very extensive and large plant near this city. [Milwaukee.—Ed.].

"Our president, Mr. William Woods Plankinton, is in thorough accord with my views and more sanguine than these few words express."

GORDON BENNETT INTERNATIONAL AERONAUTIC CUP RACE.

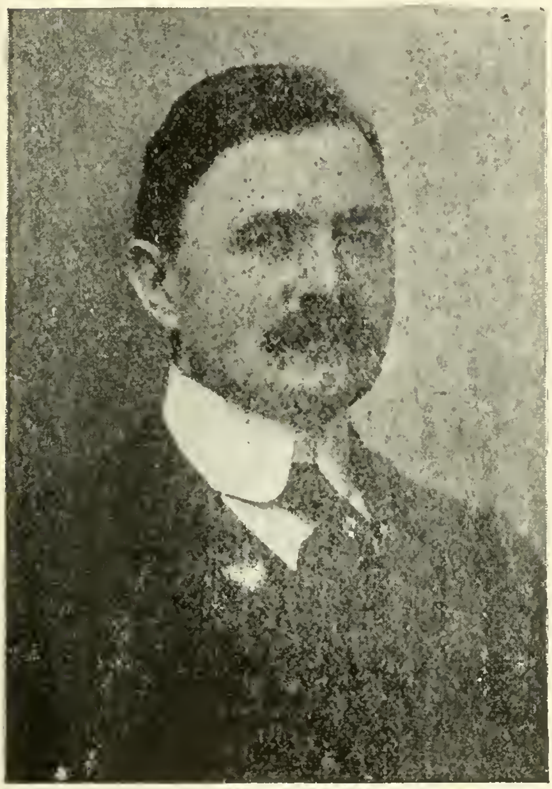
St. Louis, October 19, 1907.

Official Entries.

Aero Club of France: 3 balloons. But two of the contestants, Rene Gasnier and Alfred Le Blanc, have thus far been named.

Aero Club of the United Kingdom; 3 balloons. Contestants not yet named, but Hon. Chas. S. Rools and Mr. Griffith Brewer are certain to be appointed.

Deutscher Luftschiffer-Verband: 3 balloons; "Pommern," of 2200 cubic metres capacity, "Todewils" of 1000 cubic metres capacity and the "Dusseldorf" of 2250 cubic metres capacity. The pilots are Herren Freiherr von Hewald, Hauptmann Hildebrandt and Hauptmann von Abercron, respectively.



J. C .McCOY.

ALBERT B. LAMBERT,
Honorary Secretary Aero Club of St. Louis.

Real Aero Club de Espana: 2 balloons of 2200 cubic metres capacity each. Pilots, not named.

Aero Club of America: 3 balloons of 2200 cubic metres capacity each. Pilots, Lieutenant Frank P. Lahm, winner of the Gordon-Bennett Race of 1906, at Paris; J. C. McCoy, balloon "America," and Alan R. Hawley, balloon "St. Louis." A. B. Lambert will be Mr. Hawley's Companion.

The Societa Aeronautica Italiana entered two balloons: the "Vittoria," of 2200 cubic metres capacity, pilot Alfred Vonwiller, and the "Roma," of 2250 cubic metres, pilot Major M. Moris. The entry was not sent within the time limit under the rules (February 1, 1907) and the Federation Aeronautique Internationale felt itself obliged to disallow the entry.

The official date of the race has been set for October 19, 1907, at Forest Park, St. Louis, Missouri, there being a full moon on this date.

Gas will be pumped under pressure through a 24″ main from a gasometre holding 4,000,000 cubic feet of coal gas.

A portion of the Park has been set aside for the start of this race, which will be enclosed and grand stands erected to accommodate the spectators.

In addition to the Gordon-Bennett Cup for which this race is run, there have been offered the following prizes:

$1000 to the contestant making second place, offered by Adolphus Busch.

$750 to the contestant making third place, offered by the United Street Railways Co.

$500 to the contestant making fourth place, offered by B. Nugent & Bro.

$250 to the contestant making fifth place, offered by the St. Louis Times.

At St. Louis, during the month of October, the prevailing winds are from the South and Southwest and have an average velocity of over 10 miles an hour. On account of the currents of air, it is predicted that no contestant will be able to make any great distance to the West, that probably all the balloons will sail away to the eastward. The average temperature for that month at St. Louis is 60° F.

ALAN R. HAWLEY

LIEUT. FRANK P. LAHM

Hon. Chas. S. Rolls has just been awarded the Silver Medal for the longest time spent in the air by any pilot of the French aero club during 1906. This award is made on his record of 26 hours 18 minutes in the balloon "Britannia" in last year's Gordon-Bennett. This is entirely different from the Gold Medal awarded him for longest duration in the Gordon-Bennett.

William Woods Plankinton, it is reported, has also purchased a balloon.

A new airship company is being formed by Wm. J. Brewer, of Trenton, N. J. The plans call for from two to four cigar shaped gas bags supporting an aluminum framework 35 feet long. A 40-horsepower engine will furnish the motive power.

THE AERO CLUB OF ST. LOUIS.

By J. W. Kearney, Secretary.

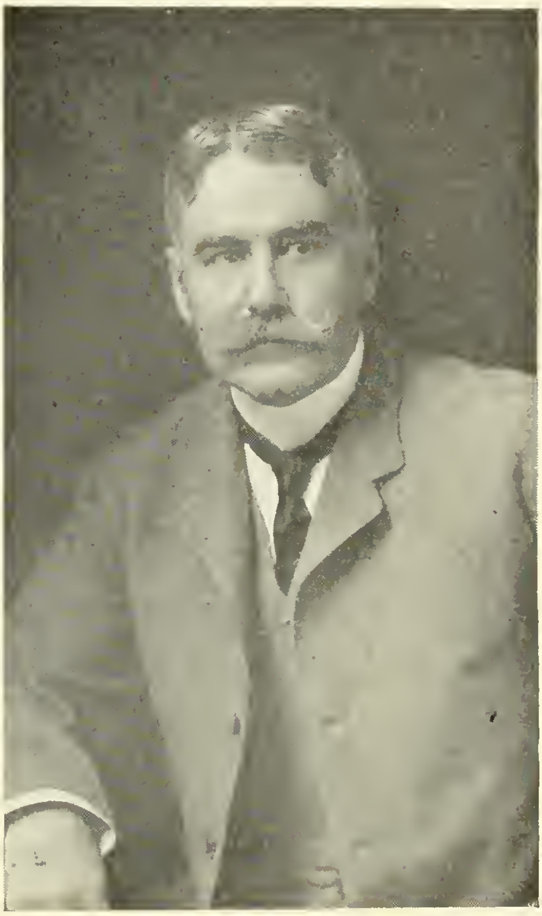
The Aero Club of St. Louis was formed the early part of this year and is the direct result of this city's having been selected as the place for holding the contest for the James Gordon Bennett International Aeronautic Cup.

When the officials of the Aero Club of America decided on St. Louis as a place for holding the race, it was suggested that an Aero Club be organized to take charge of the preliminaries and do whatever work was necessary in conjunction with the affair.

The Club was organized on January 7th with a Charter Membership of 37 of the leading citizens of the city. On January 29th a permanent organization was effected and the work of securing members was inaugurated. In ten days the limit of 300 was secured and it was later decided to increase the membership to 400. The additional 100 members came into the Club in a very short period and the Club now has a waiting list.

LEWIS D. DOZIER,
President, Aero Club of St. Louis.

More than one hundred of the four hundred members of the Club are millionaires, and in the organization are to be found the representative men of St. Louis in all lines and professions. There are railroad presidents, bank and trust company presidents, merchant princes, the leading physicians, surgeons, and lawyers of the city and one Roman Catholic Archbishop.



FRANCIS D. HIRSCHBERG,
Treasurer Aero Club of St. Louis.

The officers of the organization are:—L. D. Dozier, President; Former Governor D. R. Francis, D. C. Nugent and G. H. Walker, Vice-Presidents; F. D. Hirschberg, Treasurer; A. B. Lambert, Honorary Secretary; J. W. Kearney, Secretary.

The Ascension Grounds selected are in the east end of Forest Park, which is one of the largest parks in the world. Immediately opposite the park and directly facing the Ascension Grounds, the Club has leased a dwelling for a Club House. A Gasometer is but a few blocks away, and it is from this tank that the balloons will be supplied with gas at the time of the International race.

In conjunction with the James Gordon Bennett contest, which is for ordinary balloons, the Aero Club of St Louis has decided to hold competitions for Dirigible Balloons and Aeroplanes. These events will be held on or about October 22nd or very close to the date of the James Gordon Bennett race.

For these competitions, the Aero Club of St. Louis has offered prizes amounting to $5000. There is to be one Grand Prize of $2500 for the Dirigible Balloon or Machine of any kind which makes the best showing in the contest, provided it makes the 6-mile course, turning two goals within 30 minutes. There is also to be a prize of $1250 for the Dirigible Balloon which makes the best showing and a similar prize for the Aeroplane or any other style of machine which gives the best account of itself in the competition.

J. W. KEARNEY,
Secretary, Aero Club of St. Louis.

The winner of the Grand Prize is not to be allowed to compete in either of the two latter events.

In case the Grand Prize of $2500 is not won by any of the competitors, the money is to be divided equally between the Dirigible Balloons and the Aeroplanes or other style vehicles, each class getting $1250. This will be split up into Second, Third and Fourth Prizes as follows:—Second Price, $625; Third Prize, $400; Fourth Prize, $225. The First Prize in each class will remain at $1250.

It is the intention to make the James Gordon Bennett Cup Contest of St. Louis the occasion of a General Aeronautic Carnival, hence the events arranged by the St. Louis Club. The Club has secured pledges from the leading hotels in this city not to raise rates during the Aeronautic events, and it is more than likely that railroads will be induced to make special rates for the affair. Much interest is being taken in St. Louis in the matter, and it is believed there will be an enormous crowd in the city when the contests take place.

AEROPHOBIA.

"Germany is a nation which is second to none in the production of a special form of genius possessing an aptitude for one-sided exaggeration. If a particular combination of circumstances can produce a dangerous situation, there always seems to be someone ready to exploit that as the one and only point of view from which to observe the subject in question. As an example, there is the supposed danger which would accrue to Great Britain through the possession by other powers of immense aerial fleets, and the possibilities of which have been set forth by Regierungsrat Rudolf Martin—with a foresight which is not altogether original—in a book entitled "The Era of Aerial Navigation."

"One of the chapters, and perhaps the one which will be of most interest to Britishers, is that headed "England no longer an Island," in which the author allows his imagination some freedom of flight as to an invasion of this land by Germany. At the present stage of aeronautics such phantasies, even if presented in a well balanced form, are apt to be a little ridiculous. That the author should have entirely overlooked any inconveniences or difficulties which the occupants of the various individual ships might experience of effecting a landing is a comparatively small matter, but we frankly fail to see that any useful purpose could be served by such a book, unless the author hopes to inspire our own military authorities with an even keener desire to keep in touch with aerial development than they already possess."—Automotor Journal.

PROGRESS IN AERONAUTICS.

For I dipt into the future, far as human eye could see,
Saw the vision of the world, and all the wonder that would be;
Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down with costly bales;
Heard the heavens fill with shouting, and there rained a ghastly dew
From the nations' airy navies, grappling in the central blue;
Far along the world-wide whisper of the south wind rushing warm.
With the standards of the people plunging thro' the thunder-storm.

Locksley Hall.—Tennyson.

At no time in the history of aeronautics has the year opened as auspiciously. The problem of aerial navigation by a heavier than air machine has practically been solved. There remains now the development of the machine to a general commercial use.

In March, 1906, the Aero Club of America officially announced that the Wright Brothers had positively done what no other human beings had ever before accomplished. This announcement was made only after obtaining positive proof, and was so startling that even now the majority of the aeronautically interested abroad do not accept the authoritative statement of the Aero Club of America. America has the honor of being the first to "successfully" navigate the air.

What the Wright Brothers have actually accomplished follows:

Sept. 26, 1905—Distance, 17,961 meters (11⅛ miles); time, 18 min. 9 sec.; cause of stopping, exhaustion of fuel.

Sept. 29, 1905—Distance, 19,570 meters (12 miles); time, 19 min. 55 sec.; cause of stopping, exhaustion of fuel.

Sept. 30, 1905—Time, 17 min. 15 sec.; cause of stopping, hot bearing.

Oct. 3, 1905—Distance, 24,535 meters (15¼ miles); time, 25 min. 5 sec.; cause of stopping, hot bearing.

Oct. 4, 1905—Distance, 33,456 meters (20¾ miles); time, 33 min. 17 sec.; cause of stopping, hot bearing.

Oct. 5, 1905—Distance, 38,956 meters (24 1-5 miles); time, 38 min. 3 sec.; cause of stopping, exhaustion of fuel.

"It will be seen that an average speed of a little more than 38 miles an hour was maintained in the last flight. All of the flights were made over a circular course of about three-fourths of a mile to the lap, which reduced the speed somewhat. The machine increased its velocity on the straight parts of the course and slowed down on the curves. It is believed that in straight flight the normal speed is more than 40 miles an hour. In the earlier of the flights named above less than 6 pounds of gasoline was carried. In the later ones a tank was fitted large enough to hold fuel for an hour, but by oversight it was not completely filled before the flight of October 5.

"In the past three years a total of 160 flights have been made with our motor-driven flyers, and a total distance of almost exactly 160 miles covered, an average of a mile to each flight, but until the machine had received its final improvements the flights were mostly short, as is evidenced by the fact that the flight of October 5th was longer than the 105 flights of the year 1904 together.

"The lengths of the flights were measured by a Richard anemometer which was attached to the machine. The records were found to agree closely with the distances measured over the ground when the flights were made in calm air over a straight course; but when the flights were made in circles a close comparison was impossible because it was not practicable to accurately trace the

course over the ground. In the flight of October 5th a total of 29.7 circuits of the field was made. The times were taken with stop-watches. In operating the machine it has been our custom for many years to alternate in making flights, and such care has been observed that neither of us has suffered any serious injury, though in the earlier flights our ignorance and the inadequacy of the means of control made the work exceedingly dangerous.

"The 1905 flyer had a total weight of about 925 pounds, including the operator, and was of such substantial construction as to be able to make landings at high speed without being strained or broken. From the beginning the prime object was to devise a machine of practical utility, rather than a useless and extravagant toy. For this reason extreme lightness of construction has always been resolutely rejected. On the other hand, every effort has been made to increase the scientific efficiency of the wings and screws in order that even heavily built machines may be carried with a moderate expenditure of power. The favorable results which have been obtained have been due to improvements in flying quality resulting from more scientific design and to improved methods of balancing and steering. The motor and machinery possess no extraordinary qualities. The best dividends on the labor invested have invariably come from seeking more knowledge rather than more power."

(Signed) ORVILLE WRIGHT,
WILBUR WRIGHT.

In September, 1906, M. Santos Dumont, who has built several more or less successful dirigible balloons, made a flight of about 25 yards with a motor driven aeroplane having the following characteristics:

General Dimensions.—Length, 32 ft.; greatest width, 39 ft.; weight with one passenger, 465 lb.; lift per square ft. 5 lb.; lift per 1 H. P., 19.4 lb., at a velocity of about 30 miles per hour.

Sustainers.—Two box type wings, each 18 ft. by 11 ft.; surfaces 7 ft. apart, sustaining area 861 sq. ft.

Suspension.—The long protruding girder which carries the car is fixed at one end to the sustainers; at the other end a box shaped rudder is fitted.

Car.—A willow basket fixed in the girder above mentioned.

Propulsion.—Aluminum two bladed propeller, 6 ft. in diameter, fixed in rear of the sustainers.

Steering in a vertical plane.—The rudder can be moved right or left, by means of a steering wheel.

Steering in a horizontal plane.—The same rudder can be moved up and down by means of a steering lever, and the whole machine rises and falls accordingly.

Equilibrium.—No special apparatus.

The machine fell to the ground and was seriously damaged. In October he again tried and succeeded in travelling a distance of about 195 feet through the air after having run along the ground for a distance of 243 feet.

A third trial was made on November 12th, in which he maintained a uniform flight for about 720 feet at a speed of 25 miles an hour. This won for him two prizes, one of 100 francs for the first aeroplane to fly 195 feet, and one of 1500 francs for the first to go at least 325 feet without touching the earth. He failed to win however the Deutsch-Archdeacon prize of 50,000 francs for the first aeroplane which will fly from a given point a distance of 5-16 of a mile, and return to starting point. In the spring of 1907 he made an unsuccessful trial with a new machine.

Denmark has made a name for itself by the accomplishment of Herr Ellehommer, who, in January, 1906, flew a distance of 162 feet against the wind. The motor was then stopped and an easy descent made. The machine was of the "Wright type."

The work of the Wrights, Herring, and Chanute in America, Santos Dumont in France and Ellehommer in Denmark has added numbers to the heavier than air school, as is proven by the multitude of experimenters along this line.

Bellamy is working on an aeroplane at Weybridge, England, with which to compete for the Daily Mail and other prizes. This machine has a bamboo structure carrying a double decked aeroplane at each end. The front planes are 32½ by 9 feet. The rear planes measure 22½ by 9 feet. Both front and rear planes are placed 32½ feet apart. Lying lengthwise between them are two triangular side sails inclined up and out. The upper and lower planes are divided vertically into cells. The machine is driven upward by a horizontal plane and steered horizontally by a vertical rudder placed in the rear. A 50 H. P. Panhard motor in the center of the forward plane supplies power by chains to fans.

Clarke is experimenting at Aldershot along the line of the Wrights. His machine is similar, with the following exceptions: "At the rear, the Wright aeroplane had a single vertical plane acting as a rudder, but the Clarke device consists of two vertical planes, which are traversed about a third of their length from the top by a single horizontal plane. The main surfaces are curved on the principle of a bird's wing, and the aeronaut takes a recumbent position on the center of the lower aerocurve. Used as a kite, very satisfactory experiments have been made with this aeroplane."

M. Cornu constructed a model which, during trials, rose in the air "most satisfactorily and maintained a steady course." The weight was 30½ lbs. and the power used, 1½ horse. He is now building a large machine, fitted with a 25 H. P. motor.

The Antoinette engine people are building a machine on the designs of Capt. Ferber and M. Levavasseur, using a Levavasseur motor.

Capt. Ferber has also completed two machines of 24 and 100 H. P. respectively.

Vuia has a machine which comprises "a pair of enormous wings with a motor driven propeller. It runs on a light quadricycle frame, which the propeller has proved itself able to drive at a considerable speed and even uphill."

Very satisfactory results have been obtained by Paul Barlatier and M. Blanc, with a single aerocurve model, having a complicated tail some distance behind. A 2 H. P. Buchet motor drives two propellers in front. It is said the inventors are building a larger machine, to be equipped with a 12 H. P. motor.

Esnault Pelterie is experimenting with an aeroplane attached to an automobile. At a speed of 56 miles an hour the machine developed a lifting power of 99 pounds.

Albert Bazin has a curious machine with wings, a tail, and a hull for the driver. He uses a liquid carbonic acid motor to drive a two bladed propeller 7 feet in diameter.

On April 8, 1907 the Delagrange Aeroplane made a fairly successful flight, though damaged in landing. The wind aided the descent of the machine when the motor was stopped. The distance covered was 164 feet. In a previous flight, however, he covered 196 feet.

M. Bleriot has developed a birdlike machine, having an elongated

body, two large outspread wings with the tips turned upwards, and two vertical rudders. The two wing surfaces form a single plane. It is fitted with a 24 H. P. Antoinette engine, having a propeller 5¼ feet in diameter. The machine flew about 20 feet on the first trial. It was found that 16 H. P. would raise the machine from the ground. A gust of wind upset the machine on the second trial.

The French Government now has two dirigible balloons, the old "Lebaudy" and the new "La Patrie." The latter has made some very successful flights, in good time against a wind of over 30 miles an hour.

Henry de la Vaulx built, in 1906, a navigable balloon, which has made several more or less encouraging flights.

Captain Kindelan designed for Spain a dirigible, 115 feet long, with two very light 24 H. P. Levavasseur motors.

Henry Deutsch's enormous dirigible "La Ville de Paris," 205 feet long, with a 70 H. P. Motor, was first tried out in the Fall of 1906. The initial flight was a disastrous one. Only a short distance was traversed when the guide rope caught and in disentangling it the envelope was destroyed.

Count Zeppelin has achieved the greatest success in the lighter than air school. The results obtained by him, considering the general impracticability of dirigible balloons, is well nigh marvellous. Zeppelin has secured the co-operation of the German Government in his experiments. The Emperor and some wealthy associates have subscribed $250,000 for the conduct of these researches.

The English Government is experimenting with gliding machines under the direction of Colonel Templar, of the Military Ballooning and Aeronautical Department. Their gliders have two planes similar to the Wright glider. After being lifted into the air with kites they are released. Mr. Cody, in one instance, made a glide of ½ mile. The English War Office has under construction an airship, similar to the Lebaudy. Its lifting capacity will be over three tons.

The Russian Government has been working with aeroplanes for the past three years and the Chief of the Russian Balloon Corps claims that the "balancing problem has been solved by him, but he had not fitted any aeroplanes with motors."

Walter Wellman and Major Hersey are starting this year from Spitzbergen with their airship in an attempt to reach the North Pole. The ship is 196 feet long, 46 feet in diameter and has a capacity of 226,000 cubic feet. It has a lifting capacity of 22,000 pounds.

NOTES.

Patrick Y. Alexander writes that he will be over for the Gordon-Bennett Race at St. Louis, going from there to the Congress at Jamestown Exposition October 28th and 29th.

A. Leo Stevens has recently leased a building 197 x 120 feet at Hoboken, N. J., to be used as an addition to his balloon factory.

Col. Max C. Fleischmann, of Cincinnati, Ohio, has purchased from J. Hoddick, a balloon manufacturer of that city, an 85,000 cubic foot balloon.

Dr. Oliver L. Fassig, who has been the Director at Mount Weather since its establishment, is now Director of the Climatological Service of the Weather Bureau, Maryland and Delaware Section, at Baltimore. Dr. W. J. Humphreys is the new Director at Mt. Weather.

If ten balloon trips make an aeronautic pilot, is the man who has made trips by the hundreds a better pilot? Can America win this year's Gordon-Bennett?

Alan R. Hawley's balloon which is to represent St. Louis in the International race, is now finished. Mr. Hawley made his first flight in it from Paris June 14.

AERO CLUB OF AMERICA.

The regular Monday evening lectures have been discontinued for the Summer. Great interest has been taken in these informal affairs and an effort will be made in the Fall to make those proposed even more successful, if possible. Following is a list of the subjects treated since the inauguration of the idea.

Israel Ludlow—
"Equilibrium."

W. R. Kimball—
"Elementary Principles of Heavier-Than-Air Machines."

T. T. Lovelace—
"Earthquake at Kingston," Illustrated.

Carl Fischer—
"Pigeon Flying."

A. M. Herring—
"Aerial Propellers and Light Metals."

Carl Dienstbach—
"Propellers."

W. R. Kimball—
Demonstration of His Helicoptere Model.

Wm. J. Hammer—
"Illuminated Dust."

Harry E. Dey—
"Light Motors."

C. H. Taylor—
"Explosive Engines."

From time to time there are opportunities for club members who do not own balloons to make ascents. It would be advisable for those wishing to make trips to place their names on file with the Secretary in order that they may be communicated with when such occasions arise.

The Club has now arranged that its rooms are open to members every day and evening throughout the entire week. All foreign aeronautical magazines are kept on file and much interesting reading will be found in the library, to which is constantly being added both new and rare books on aeronautics.

Word has been received by the Aero Club of America, that the Aero Club of Spain will have but two balloons in the Gordon-Bennett race, instead of three as originally entered.

IS THERE AT ANY TIME DURING THE FLIGHT OF A DIRIGIBLE BALLOON A GREATER AIR PRESSURE AT ANY OTHER POINT THAN AT THE THEORETICAL "NOSE?"

Consider a course from one point to another with the wind blowing at an angle with the line drawn between the starting and finishing points.

To gain the objective point the dirigible must be headed to the windward of the objective point. The theoretical angle of direction can be determined by compounding the speed and direction of the wind and the speed and direction of the airship. If the direction of the wind is across or opposed to the direction of travel, a greater distance, with relation to the air, must be traveled and it is self-evident that there would be increased fuel consumption.

Theoretically, the machine would head directly into the **relative** wind if the natural wind were uniform. However, the wind is not stable—it consists of a succession of gusts.

There is increased pressure on the windward side during the momentary increase in the speed of the wind. There is also an unbalanced excess of pressure on the lee side during a lull in the wind. These changes cause the airship to assume a twisting movement which is further complicated by the gyroscopic action of the screw and the gyrostatic action of the air-stream flowing in a curved path along the "nose" of the bag, the combination of all the forces producing a sort of "corkscrew" pitching of the balloon which increases in violence with the increase in speed of the wind as well as with increase in speed of the screw.

AMERICAN MAGAZINE OF AERONAUTICS

ERNEST LARUE JONES, EDITOR

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Furnished on application. The value of AMERICAN MAGAZINE OF AERONAUTICS as an advertising medium is unquestioned.

A LETTER TO AERONAUTS.

The American Magazine of Aeronautics is very desirous of obtaining accurate and complete records of all balloon and airship flights made in America during each month.

We would appreciate it very much if you would send us such records at the end of every month and we would be very glad to supply you with the blank forms for the purpose upon request.

May we not expect to hear from you?

American Magazine of Aeronautics.

PRIZE WANTED

For Heavier-Than-Air-Machines

(Without Gas Bag).

It is of the utmost importance that a cash prize of a considerable amount be hung up to encourage and reward the successful work of the hundreds of aeronautical inventors in this country.

As it is now, there are many claiming that they have a practical flying machine. There is an almost insurmountable difficulty encountered by these inventors in bringing their machine to the attention of capitalists. After they have completed their work they find that it has all been in vain—they either cannot enlist capital or come to the conclusion that a flying machine is of no value for business purposes or for sport. Many see no future for a machine and do not put their ideas into any concrete shape.

Here is an instance of the present difficulty. A certain man claims most positively he has a machine that will lift into the air double its own weight. He still has to arrange for steering mechanism and means for propulsion. He does not wish to use any more of his own money nor that of his friends until he can see a return for the money invested in the event of bringing the machine to a successful completion. If there were a cash prize of $25,000 available, he would at once procure the necessary funds and complete his machine. He is willing to take his chances on the machine's not fulfilling the conditions. He merely wants something to work for, something that will repay him for the time and money expended.

The prize should be at least $25,000. There are several prizes of $50,000 offered abroad. The money should be available to the successful contestant immediately upon his fulfilling the conditions under which the prize is contested—say, the flight out and back over a mile course, with provisions in the rules for turning, ascending and descending, &c., to prove the machine's absolute dirigibility.

This method would eliminate the many impossible machines now built or projected. It would provide a suitable reward to the successful man. There would then be no trouble in finding a market for the machine.

AERONAUTICS IN ENGLAND.

By Major B. Baden Powell.

I feel somewhat in the position of that well-known author who, in writing a book on the natural history of Ireland, had a chapter on "snakes," but which consisted solely of the sentence, "There are no snakes in Ireland." But the present subject is rather different, for, while unable to say much about it, I have reason to believe that a good deal is being done in England in the construction of apparatus for navigating the air. I have heard rumors of at least five inventors at work on large machines, but each of them is trying to keep the matter dark, and, therefore, what few facts I have gleaned must be kept to myself for the present. On a future occasion, however, I shall hope to be able to send some description of them. So much, then, as regards flying machines, or that system known in France as the "heavier-than-air" type. This term, it seems to me, is not a happy one. Many machines have been suggested and even tried, to-wit, the latest of M. Santos-Dumont's, which are heavier than the air they displace, and yet which include a large gas balloon. I suggest as simpler and more explanatory the term "gasless" for those machines which rise in the air solely by the aid of propelling machinery.

Gas-filled airships are not much in favor in England, and there is probably not a specimen, in working order, to be found in the country.

Ballooning, pure and simple, forms a different subject and is one in which great strides have been made of late. The strides, however, have been rather in the number of ascents and in the increase of amateur aeronauts than in any technical improvements in the apparatus or methods. "Balloon parties" at country houses have become the rage (in a very limited sphere, I admit). I was staying lately with a friend, where there were ten guests, and three balloons went up, taking all the house party. Then we have had some interesting contests. The "Harbord Cup," presented by the Hon. Mrs. Assheton Harbord, drew ten balloons to the starting point at Ranelagh (near London). A point, Goring railway station, was decided upon by the Committee just before the start, as winning post. This was over 40 miles distant, yet three out of the ten starters managed to descend within a few hundred yards of the point selected. A contest which is likely to prove still more interesting, is the "Hedges Butler" cup, which is to be competed for on June 29. This prize is to be awarded to the owner of the balloon which makes the longest voyage on that day. But we in England are so very dependent on climatic conditions that it becomes very doubtful if the race will be a success. Not only is it as likely as not to be blowing strongly, but our prevailing winds, westerly and southwesterly, soon carry one from London to the North Sea and a run of 60 to 70 miles is the most that can then be hoped for.

A. M. OF A.'S GERMAN CORRESPONDENT.

Dr. Hermann Stade, Member of the Royal Meteorological Institute of Germany and Secretary of the Deutscher Luftschiffer-Verband, will contribute a monthly article to this magazine. In the August issue Dr. Stade will write upon the "Status of the Aeronautical Science in Germany."

WINGS MORE EFFICIENT THAN SCREWS.

Several special claims are made by Mr. John Spies for the airship wings he has designed. He has been experimenting for over forty years, and he thus expounds the fundamental principles which have guided him in all his experiments:—"That a successful airship must be 'heavier than air' was one, that the machine must be 'rigid' was another, and that it must be in a condition to rise from the ground by its own power was the third. As my teachers in all these endeavors, I consulted birds in their actions and constructions. Not only birds, but other living creatures also came into my observations. None of them could 'fly' without their wings, and it became firmly settled in my mind that in wings was contained the mystery and solution of flying.

"To make such as would elevate and propel was the great object of all my experiments. I have made uncounted numbers of wings, singles and pairs, of all shapes and sizes. It was an easy matter to get such as would elevate, but to make them also propelling devices was something that puzzled and baffled me over and over again. Often I was near losing hope of ever getting to that point, but still kept on, and at last success crowned my perseverance.

"I can now show to any interested person wings that will do exactly what those of a bird perform. They will with every stroke, up or down, elevate and propel, but, in reality, the downstroke is the lifting and the upstroke the propelling one, the latter with great force. Actual experiments with a 5 H. P. gasoline motor, the wings measuring 11½ ft. in length by 7 ft. across at their widest part, made in five sections, gave proof positive that they will lift 100 lb. and more, and I know now that in the use of wings is contained the solution of the great problem of aerial navigation.

"A pair of wings properly constructed and driven by a 10 H. P. motor have greater propelling force than a screw propeller driven by a 50 H. P. motor. Of all these points I have proof, and will now go before the public to demonstrate the truth of assertions."

The model wings illustrated are 10 ft. long, lightly constructed of cane and silk, and were attached to a 5 H. P. motor weighing, with tank, 100 lb. The result, according to Mr. Spies, was that with each downstroke the whole affair was lifted 6 to 8 in. from the ground, thereby demonstrating the lifting capacity of wings of this description. In the upstroke, he declares, four men holding on to the frame felt a distinct strain of forward movement. This, in itself, demonstrates, he maintains, the possibility of their driving an airship in any direction desired.

LONG DISTANCE BALLOON RECORDS.

1836—Longest journey starting from England by balloon. Made by Green, Halland and Mason, who crossed to Nassau, 500 miles. Time, 18 hours.

1859—Longest trip in America. Made by John Wise, who travelled from St. Louis to Henderson, N. Y., 1,150 miles. Time, 19 2-3 hours. This was his four hundred and sixty-first voyage.

1870—During the siege of Paris an aeronaut reached Norway, 1,000 miles. Time, 15 hours.

1900—Henry de la Vaulx barely made the world's record, held up to this time by John Wise, by travelling from Paris to the Russian border, 1,200 miles. Time, 35¾ hours.

1906—Two German aeronauts hold the record of 52 hours in the air.

SCHOOLS OF INSTRUCTION IN AERONAUTICS ESTABLISHED IN GERMANY AND FRANCE.

On May 1, 1907, a school was opened at Chemnitz for theoretical and practical training in the construction and management of airships. The director, Herr Paul Spiegel, is a man of exceptional ability and of broad experience in every phase of balloon construction and management. He has made over 600 ascents. The tuition for a year's course has been fixed at $149, payable in monthly instalments. Examination will be held at the close of the course, April 30, and certificates of proficiency will be given the graduates. The training will be confined almost exclusively to the field of balloon construction and operation.

In France there is no actual "school" for training aeronauts in which a definite course is pursued. Such practice and instruction in aerostation as is offered is provided by the clubs and by the Government in connection with the military service. In Paris there are four important aeronautical societies or ballooning clubs, and five similar organizations elsewhere in France. These clubs were created for the promotion and practice of ballooning as a sport as well as for scientific study and experiment. In some of these young men are given practical training, taught the theory and construction and use of balloons, their proper care and navigation.

If the students acquire a certain proficiency and pass a prescribed examination, they are permitted, when drawn for military service, to enter the Bataillon d'Aerostiers, established in the old zoological garden located between Versailles and St. Cyr. The post is under the control of a commandant and the men are taught and practice the handling and care of the Government balloons, of which there are several of a capacity of less than 900 cubic metres.

The second and more important institution of this kind in France is known as the "Establishment Central du Materiel de l'Aerostation Militaire," at Chalais-Meudon, midway between Paris and Versailles. It has been in existence nearly a hundred years, and is divided into two general departments—the factory where the balloons and equipment are made and the department of tests and experiments. There is no definite course of instruction. It was there that Colonel Renard twenty-three years ago built and experimented with "La France," the first dirigible balloon.

AERONAUTIQUE CLUB DE FRANCE.

By Monsieur J. Saunière, President.

The Exhibition of small model aeroplanes, which took place under the auspices of the Section d'Aviation of the Aeronautique Club de France on June 9th at the Galerie des Machines, brought together sixteen competitors with twenty exhibits entered, of which fifteen apparati were actually presented by the following: Messrs. Partiot, Budin, Paulhan, Audiguey, Descognier, Fourgeaud, Ballandier, Buguière, Henry, Razet and Quefféléant.

The best flights were obtained by the Langley type aeroplanes of Messrs. Budin and Paulhan. The jury, which was composed of Messrs. Archdeacon, Captain Ferber and G. Voisin, awarded them two First Prizes, silver medals, the apparati being similar. Bronze medals were awarded to Messrs. Audiguey and Buguet for the mechanical work on their models.

We can announce another trial in the near future, for which M. Archdeacon has offered a prize.

The Directors of the Aeronautique Club de France after having admitted twenty-one members, confirmed the decision of the Sports Committee relative to the contest of the 26th of May, awarding First Prize to M. Lassagne, Second Prize to M. Cormier and Third Prize to M. Vernanchet.

It has been decided to put gas at the disposal of members at the price of 130 francs per 1,000 cubic meters and to grant subsidies to pilots representing the A. C. D. F. in national and international races.

The Section d'Aviation is making plans for the organization of a great international contest for small model aeroplanes, with and without motors, for which numerous prizes will be offered.

NOTES.

A visit to the balloon factory of Mr. Stevens the other day was rather surprising. No less than eleven balloons were found, either completed or in course of construction. One of 80,000 cubic feet capacity is for the United States Government. Mr. J. C. McCoy, one of the representatives of America in the Gordon-Bennett Race this year, is having one built of 36,000 cubic feet. Another of 60,000 cubic feet goes to a Mr. Baxter, in Florida. Still another goes to far-off Johannesburg, South Africa. Mr. Elmer Van Ranken, of Gloversville, N. Y., is having an airship built which will contain 9,500 cubic feet of hydrogen. Two captive balloons have gone to an enterprising couple of young men at Norfolk, who are operating in a park of their own just outside the Jamestown Exposition. The other purchasers are: Oscar Hendler, James H. Hare, Joseph Cali and William Thaller.

The Aero Club of Belgium will hold an international balloon contest for distance on September 15th, at Brussels. Entries are invited, and prospective contestants are asked to get their applications in as soon as possible.

Dr. Julian P. Thomas has practically completed the alterations which he has been making to the dirigible balloon which he purchased from Major C. J. S. Miller last year. The envelope has been lengthened considerably, and an entirely new frame work has been constructed.

Prof. Otto Luyties, an engineer who was associated with Prof. Wood of John Hopkins University in his aeronautical experiments, tested out his flying machine on June 15th, but met with a slight accident. In being pulled along by an automobile, the machine fell with such force as to smash the front wheel supporting the framework and the propeller.

Percy F. Megargle and George T. Tomlinson are planning to construct an airship with which to make flights at the Jamestown Exposition. Mr. Tomlinson announces his intention of beating Lieutenant Lahm's record of 402 miles.

Some idea of the interest in this country in the dirigible balloon may be gained from the fact that, in addition to a number of balloons, seven airships are in course of construction at the "balloon farm" of Mr. Carl E. Myers.

The illustration is that of the "King-Fisher," the invention of Mr. Jacob Fisher, of Columbus, O. The envelope is 74 feet long, 22 feet in diameter and contains 14,000 cubic feet of hydrogen, the lifting capacity being 900 pounds. The propeller blades are adjustable to various angles and are driven by two light motors whose fly-wheels act as friction discs to drive the propeller fast or slow. Situated on either side of the car are two other screws having blades that furl at any desired portion of a revolution and open to drive the ship up or down, forward or backward, to right or left, as may be desired, and at varying speeds. It is claimed that this airship has remarkable equipoise.

AERONAUTICAL MOTORS.

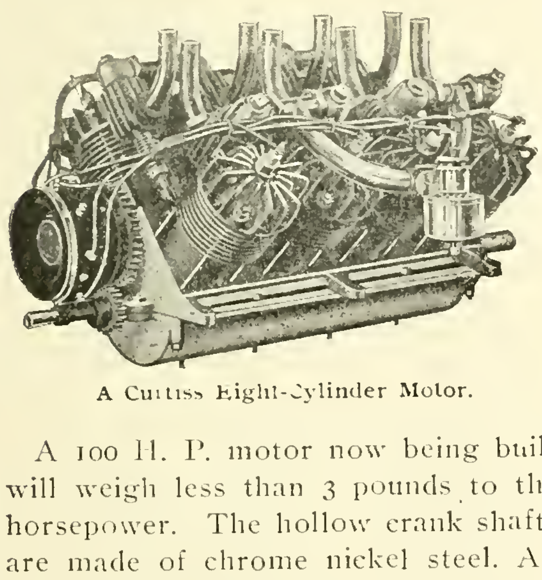
It is intended to publish in each number a description of the various light motors now on the market which are adapted for use in dirigible balloons and heavier-than-air machines.

CURTISS MOTORS.

The G. H. Curtiss Manufacturing Co., Hammondsport, N. Y., foresaw the approaching demand for light and powerful motors and two years ago began to devote a great deal of attention and study to this type of engine.

Having already developed their cycle motors to a high degree of efficiency, they began to experiment with multi-cylinder engines until they brought their present line of engines to the same high standard.

These motors range from 1 to 8 cylinder and from 3 to 100 H. P. They have found that the most practical design of motor for aeronautical work is the 8-cylinder, the cylinders being set at an angle of 90 degrees. The power from such an engine is constant, each explosion stroke commencing when the preceding one is but half over.



A Curtiss Eight-Cylinder Motor.

A 100 H. P. motor now being built will weigh less than 3 pounds to the horsepower. The hollow crank shafts are made of chrome nickel steel. All bearings are ground to size and the boxings are made of a special alloy which is very light and at the same time extremely strong and durable The cylinders, pistons and rings are ground to size and are interchangeable. All bolts and studs are made of a special grade of nickel steel, while the aluminum crank case is also made of a special alloy. The ignition is effected by the use of a single jump spark coil and a distributor attached to the commutator. This system is so efficient that only four small dry cells are necessary. The lubrication is by the splash system with two sight feed oilers supplying oil constantly to the case from which compression is relieved through the hollow shaft.

Corporal Edward Ward and Private Joseph E. Barrett have been assigned by the Commander at Fort Wood to the balloon workshop of A. Leo Stevens to study the various processes in the manufacture of the balloons.

Russell E. Gardner, a member of the Aero Club of St. Louis, has recently purchased from Campbell & Honeywell the old balloon "Mars" and has rechristened it at a recent ascent the "St. Louis."

The Real Aero Club de Espana has ordered three balloons from Surcorf for this year's Gordon-Bennett.

CHRONOLOGY OF RECENT EVENTS

May 20. First race of the season for the Aero Club of France, in which fourteen balloons started.

May 24. Walter Wellman leaves London for Spitzbergen. The start for the pole will be made between July 20 and August 10.

May 25. Ten balloons race from Ranelagh for the Harbord Cup, awarded to the competitor descending nearest to a predetermined spot. Won by Mr. Frank H. Butler in his balloon "Dolce Far Niente," making a landing within 100 yards from the mark.

May 30. Lincoln Beachey makes a long flight in his dirigible, near Boston, Mass.

May 19. Balloon race at Mannheim. Nine balloons started for H. R. H., the Grand Duke of Baden's cup and other prizes. Won by Capt. H. Von Abercron, landing after a trip of 263 miles, in France.

June 2. A military balloon in charge of Captain Olivelli is struck by lightning at an elevation of 1300 feet, during an ascent at Rome and set on fire, resulting in the death of the aeronaut. This is the first balloon on record to have been struck by lightning. The cause is ascribed to its coating of metallic paint.

June 2. Ten balloons make ascents at Barcelona, Spain.

June 2. Dr. Alexander Graham Bell arrives in Halifax to begin work on his tetrahedral kite, which is to be equipped with a 15-horsepower motor weighing 120 pounds.

June 6. Beachey flies his airship at Boston. Owing to engine trouble the balloon was carried over the harbor. Repairs to the engine, while drifting with the wind, enabled the pilot to regain shore in safety.

June 7. Eugene Goudet makes a flight in his dirigible at Jamestown Exposition. Owing to some trouble the balloon dived into the waters of Hampton Roads, striking the warship "Alabama," whose sailors rescued the aeronaut.

June 7. Dowager Queen Margherita, of Italy, offers a cup for the successful balloon passage of the Alps.

June 8. A. Roy Knabenshue makes an ascent in his dirigible at Hartford, Conn. At the height of 1000 feet over a river, the gas suddenly condensed, bringing the ship down with great rapidity. Knabenshue disappeared beneath the water, but succeeded in disentangling himself. The ship was badly damaged.

June 8. Santos-Dumont attempts flight with his combination dirigible balloon and aeroplane. In starting, the propeller struck the ground and the balloon collapsed.

June 9. Dedication at Jamestown Exposition of the first building at any exposition in the history of the world devoted exclusively to the aerial branch of transportation.

June 12. Nine balloons race from St. Cloud.

June 20. Leon Beachey made a very successful flight in his airship at South Beach, Staten Island. Various maneouvres were executed and a gentle landing made at the conclusion of the trial. The ship has but a 10 horsepower engine, which is to be regretted.

June 25. Lincoln Beachey in his airship makes a trip of eighteen miles measured in a straight line, from South Beach, over New York Bay to Hell Gate, landing once in Battery Park at the lower end of Manhattan Island. The crowd damaged his propeller in making this stop, but after hurried repairs the trip resumed, passing over the sky-scrapers of Lower New York and up the Island. The broken propeller began to give trouble and the aeronaut shut off the engine and allowed the balloon to drift, with intention of making a final landing on Ward's Island. A sudden gust of wind seized the little bag when over Hell Gate and whirled it into the water, the envelope striking a buoy and being torn. Difficulty was encountered after leaving Battery Park. There was considerable wind pressure on the side of the envelope which blew the ship to the eastward, despite the work of the motor. The envelope has a capacity of 6500 cubic feet and the motor is 10 horse power. The entire ship weighs but 250 pounds.

June 27. Captain Thomas S. Baldwin makes the first flight in his new airship "Twentieth Century" at Hammondsport in the presence of War Department officials. The trip lasted thirty minutes and was most successful. The envelope measures 52 feet in length and 17 feet in diameter and contains 9000 cubic feet of hydrogen. A 16 horse-power Curtiss motor drives the two screw propellers. Captain Baldwin will make an ascent in August for the Aero Club of America.

NEW AERONAUTIC BOOK.

The Aero Club of America has published an exceedingly interesting book, in which technical papers appear side by side with accounts of famous balloon trips and prophesies for the future.

Among the contributors of scientific articles are, the Messrs. Wright, A. M. Herring, Octave Chanute, Prof. W. H. Pickering, Dr. Alexander Graham Bell, Dr. Oliver L. Fassig and Prof. David Todd.

To those who have forgotten events a half century ago, Prof. Lowe's story of his balloon trip from Cincinnati, Ohio, to Unionville, South Carolina, during the Civil War, will prove of exceptional interest. Lieutenant Lahm writes the story of his famous flight from Paris to Scotland in last year's Gordon-Bennett Race. The book contains twenty-three chapters, in addition to a preface and introduction. Sixty-five illustrations add considerable to its attractiveness.

Each member of the Club is entitled to a copy of this book free of charge through a special arrangement with the publishers, Doubleday-Page & Co.

Credit must be given to Messrs. Post, Hammer and Ludlow for their labors in making the book an accomplished fact.

RARE AERONAUTIC BOOKS FOR SALE

This magazine will publish each month a list of such rare books relating to aeronautics as it is able to secure.

If you desire any of those listed, kindly send check with your order for the amount stated. Should the book ordered be sold previous to the receipt of your order, the money will be promptly returned.

Astra Castra (Hatton Turner). Royal 4to, cloth, gilt top, uncut, London, 1865............$15.00

By Land and Sky (John M. Bacon). Four illustrations. 8vo, cloth, uncut, London, 1901 $ 2.50

A Balloon Ascension at Midnight (G. E. Hall). Plates by Gordon Ross. 8vo, boards, uncut. San Francisco, 1902. Limited edition 2.50

An Account of the First Aerial Voyage in England (Vincent Lunardi). Portrait of Lunardi by Bartolozzi and plates. Crown 8vo, half calf, uncut, London, 1784. Autograph "V. Lunardi" on fly-leaf......... 15.00

Travels in Space (G. S. Valentine and F. L. Tomlinson). Introduction by Sir Hiram Maxim, 61 plates. 8vo, cloth, London, 1902. .... 2.00

My Airships (Santos-Dumont). Illustrated. Crown 8vo, cloth, uncut, London, 1904......... 2.50

Proceedings of the International Conference on Aerial Navigation, Chicago, August 1-4, 1893. Plates, 8vo, cloth, New York, 1894 .... 2.50

La Machine Animale (J. Marey). Illustrated, 8vo, cloth, Paris, 1878, French 1.25

Experiments in Aerodynamics (S. P. Langley). Illustrated, 4to, cloth, Washington, 1891.. 2.00

Five Weeks in a Balloon (Wm. Lackland). 12 mo., cloth, N. Y., 1869...................... 2.50

Balloons, Airships and Flying Machines (Gertrude Bacon). 12 mo., cloth, N. Y., 1905 .... 1.00

Balloon Travels (Robert Merry). 12 mo., cloth, N. Y., 1865 .... 2.50

Conquest of the Air (John Alexander). 12 mo., cloth, London, 1902 .... 2.00

Wonderful Balloon Ascents (F. Marion). 12 mo., half leather, N. Y., 1871 .... 2.50

Travels in the Air (James Glaisher). 8vo., cloth, Phila., 1871. 7.50

Crotchets in the Air (John Poole). 12 mo., cloth, London, 1838 .... 5.00

The Motor and its Chief Application, Wings, Propulsion in Air, etc. (Com. of Pat., 1849). 8vo., paper 1.50

PRIEST INVENTOR OF NOVEL AIR-SHIP.

The REVEREND DR. JOSEPH AULINO, Knight of Honor, Author, Dr. of Divinity, Prof. of Latin and Greek, in the Italian Universities for eighteen years, contends that universal peace is an established institution by reason of his novel invention. He claims that the force of wind will draw the balloon into it. The Reverend is with-holding details until his patent rights are fully protected in all of the countries of the world. After twenty years of study and experimenting he has at last perfected an airship which he claims is the sole solution of the Aerial Navigation problem. His plan is to have the driving and steering apparatus attached to the gas-bag instead of the car structure but with full control of the machinery centered in the car. It is by the application of the power of recoil that the balloon is to be controlled. The harder the wind blows, the better the balloon can be guided by it.

A hundred thousand dollar corporation has been formed for the manufacturing of the Reverend's device, at the head of which corporation Reverend Dr. Joseph Aulino takes place.

The classification of the stock is exclusively common. A demonstration of his device is promised within a short time. The secretary of this company is Mr. Edward Fischer Brown, of 150 Nassau Street, New York City. Many years of Mr. Brown's career have been devoted to the study of aerial navigation. He is a poet well known on the East Side as well as an ardent advocate of Zionism. He has been connected as secretary and treasurer of the Liberal Emmigration League, a philanthropic institution and has assisted many hundreds of emigrants in entering the port of New York. As soon as the patent rights will be protected, photographs and detailed data will appear iu this publication.

CASPAR WHITNEY, IN "OUTING".

Hot Air

With the loyal object of hanging upon the Pole the beautiful Aëro Club flag with which, at a New York love feast recently he was presented, Walter Wellman is preparing to float northward. Mr. Wellman is of a hopeful nature; with a sand bag or so, a few personal belongings, and, let us pray, something material to cheer the journey through the light, hot air, he will take seat beneath his huge gas bag and trust for the best. Since he will have very little more control over the direction of his balloon than either you or I sitting comfortably on earth, it is well his nature is thus hopeful.

To the less spectacular, if more practical, mind a trip across the Atlantic or even across New Jersey might suggest itself—especially since chance of reaching the Pole would seem to be equally as good from that starting point as Spitzbergen. Of course there might not be so much advertising in it—and we should like to see Mr. Wellman get all the notoriety he courts—and return to enjoy it.

For the rest, we cannot take Wellman and his gas bag seriously; *aerial navigation has not yet advanced beyond the mere toy stage with the longest of its flights still within eye range.* As for sending up a balloon to be blown whither the wind listeth—well, I hope Wellman is provided with a stout drag and a long rope.

Perhaps Mr. Whitney has not heard of the Wright Brothers whose flight of over twenty-four miles in a heavier-than-air machine is a matter of record. We would consider this distance beyond ordinary "eye range."

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L'AEROPHILE
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SUMMARY

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Furnished on application. The value of AMERICAN MAGAZINE OF AERONAUTICS as an advertising medium is unquestioned.

OUR AERO CLUB.

The Aero Club of America was formed by several sportsmen, experimentors and scientists, for the laudable purpose of advancing the development of the science of aeronautics, for the encouragement and organization of aerial excursions, conferences, expositions, congresses and the conduct of meets, contests and exhibitions of air-ships, balloons and inventions designed to be propelled through the air.

Has it taken any steps to carry out its avowed purpose? We think it has, so far as it has been able under numerous handicaps.

In January, 1906, it held its first exhibition at the 69th Regiment Armory. Considering the limited time in which to secure exhibits, the affair was a pronounced success. A goodly number of exhibits were brought to light and people were awakened to the importance of aeronautics and the actual work that had been previously done by experimentors.

During the Summer of 1906 a few balloon trips were made, thirty-three. in fact, by members of the club from different points. These were enjoyable trips, as most of the members making them were novices, and they did not consider the inconveniences to which they were put in order to make these flights.

In September renewed interest was manifested in ballooning because of the winning of the Gordon-Bennett International Aeronautic Cup by the Aero Club of America, through its representative, Lieutenant Frank P. Lahm, on the occasion of the first contest for this cup. This success brought to America the handsome trophy for competition this year, among the aero clubs of the world, at St. Louis.

The second exhibition of the Club was held in December at Grand Central Palace, and was even more of a success than the previous one.

This year a number of flights have already been made, and we are now looking forward to the Congress at Jamestown Exposition and the Gordon-Bennett in the Fall.

What the Club most needs is a park, situated so that good gas can be obtained, where members may make flights. This should be not over thirty miles from New York, with many trains each way. A member could then telephone to the grounds in the early morning and have his balloon all ready for him when he arrives in the afternoon. An aeronaut could thus go on any day on which the wind was favorable and would not have to go off a hundred miles and wait for favorable winds, wasting his time on the hotel verandah, as has been the experience in many cases heretofore.

In France, in the case of at least two clubs, all the resources of the society are expended wholly in providing ascensions for its members, the number of which during any given year being governed by the condition of the treasury. Each ascension is in charge of a competent pilot designated by the president from among the members. The only requisite is that a member shall have been of six months' standing and pay to the treasurer a number of days before the ascension 20 francs ($4) as his contribution to the expenses of inflation and return of material after the descent. If a trip of over 50 kilometres is made, the members who have made the ascension are required to pay jointly the expenses of return for the distance exceeding the prescribed 50 kilometres.

It does seem reasonable to suppose that our Government might pay a share of the expenses of each trip made by a member, in return for which the member would agree to furnish certain information to the Weather Bureau. The Government does now send up small balloons for the purpose of making meteorological records and for studying the currents of air. If the same amount of money now expended by the Government in this way were applied to the expenses of members' flights, the Weather Bureau would secure much more complete information at the same cost. More flights would be made and more records obtained. There would then be an inducement to members to purchase balloons. The expense now prohibits many. Of course, this arrangement would, perhaps, work a hardship on some members in demanding these complicated records, but such work by the member would be of considerable value to him in future trips. There are many who attribute Lieutenant Lahm's victory to the knowledge and experience of Major Hersey, of the Weather Bureau, who accompanied him. One can hardly imagine but that the experience gained in collecting these records would be of value to those trying for long trips. When the Aero Club instituted its ascents the Weather Bureau asked for copies of the records kept by the aeronauts and same have been furnished to some extent. These records, however, have merely shown the altitude reached and the direction of the winds, which information the Bureau's own stations, of course, furnished.

Land could be secured for little or nothing at many towns in New Jersey and along the Hudson River. The matter of securing the proper gas is the greater question. There is also the matter of expense in erecting suitable buildings for the housing of members' aerostats, the club building, the cost of maintenance, a superintendent and helpers. It might be able to secure the funds by solicitation among the wealthy members of the club, but the better way seems to interest the Government in some such project.

The Balloon Corps of the Army might make this Club Park a sort of station where soldiers could be instructed in ballooning through taking active part in the ascensions of members. Those of the Army studying aeronautics for military purposes could accompany the members and take the necessary records and notes for their own use and for the Weather Bureau on a sharing-of-expense plan.

This magazine would be glad to receive for publication the views of Aero Club members on this subject, with the idea of bringing about the realization of some system whereby ballooning would become more popular as a sport and as a means of acquiring scientific knowledge.

IMPORTANT NOTICE.

We have received numerous letters of inquiry from people who subscribed last year to the "Aeronautical News," of which the editor, Carl Dienstbach, issued but one number. We wish to state that this publication is in no way connected with the above-mentioned journal, and we have not assumed its contracts. Had there been any possibility of our not continuing to publish the American Magazine of Aeronautics we would have promised our subscribers in the initial number to refund all subscriptions paid in case of discontinuance of publication.

PROVIDENCE BALLOON RACE.

We regret to announce the abandonment of the proposed balloon race at Providence, R. I., on July 31.

The City of Providence invited, through its committee, aero club members and others, to participate in a distance contest, proposing to pay all expenses of the entrants, furnish several handsome cups as prizes, and to entertain the aeronauts during their stay. After five entries had been received and all arrangements practically completed the city found that it could not fulfill its promise and was compelled to request the withdrawal of entries. This contest would have been the first of such importance ever held in this country.

A LETTER TO AERONAUTS.

The American Magazine of Aeronautics is very desirous of obtaining accurate and complete records of all balloon and airship flights made in America during each month.

We would appreciate it very much if you would send us such records at the end of every month and we would be very glad to supply you with the blank forms for the purpose upon request.

May we not expect to hear from you?

LIGHT ENGINES

By Harry E. Dey.

Perhaps in the future, when the art of flying becomes an every-day event, the need of a light engine will disappear; but at present we have got to get every part down to the limit of lightness, even to training down the operator to a living skeleton. It is best, however, not to be too economical with the wing structure—a break there spells death. With the engine, however, an accident would generally be followed by no more serious consequence than would be the case with an automobile under similar circumstances, unless the landing enforced thereby should be in water, or some other undesirable location.

I do not wish to be understood by the above as favoring weak construction in the engine, but it is unnecessary to calculate the proper strength and then multiply it by ten for good measure.

In designing a light motor our first object should be to avoid all unnecessary parts, and the most important of these will naturally be the water and water cooling system, with its pump, radiator, pipes, jacket, etc.

The high speed of the flying machine is very favorable for air cooling; the practically steady load, however, is not. Perhaps the strong cool draft due to the former will balance the constant full load which the automobile air cooled motor does not have to meet.

For cooling purposes, it is desirable to have as large an amount of cooling surface as possible. My method of accomplishing this has been to use steel tubing for the cylinders, of very heavy guage, and rotate them before a gang of milling cutters so as to cut deep grooves around the tube, the cutters being about one-sixteenth inch thick, and spaces about one-thirty second inch apart; thus providing flanges one-thirty second inch thick and spaced one-sixteenth inch apart, of any desired depth. One-half inch for the latter is ample. The remaining thickness of the cylinder wall need not be over one-sixteenth inch for cylinders up to six inches bore. The heads may be similarly treated, provided they are not made of too complicated a design; if made of the common side valve construction they may be rotated about two centers, the main center and the valve center.

The side valve construction, however, is not desirable as it gives too large an absorbing surface for the heat, the object in designing being to have the minimum surface possible on the interior, and the maximum attainable on the outside. For this same reason a long stroke is desirable, for even with the longest stroke that is practical the explosion takes place in a very flat compartment, which necessarily gives a very large amount of surface relative to the cubical contents. Of course this flatness lengthens out until the dimensions are reversed as the piston travels along, but this latter condition is only reached after the charge has lost a very large amount of its heat, due to the expansion and work accomplished.

It is common practice in air cooled designing to use a very low compression compared with water cooled practice. The compression spare is made large in proportion to the stroke and mechanical inlet valves are used so as to obtain atmospheric pressure, as near as possible, at the end of the suction stroke. I do not approve of this method, however. I believe that the better plan is to provide a very small compression space and then throttle the incoming charge by means of a strong spring governing the automatic inlet valve. This restricts the charge to the desired amount to give the proper

compression in the small compression space. This compression may be carried considerably higher than in the other type, for it is reached so much later in the stroke that it does not have time to heat and pre-ignite, and, also, the pressure drops so quickly after the piston begins to travel downwards that the heating is not nearly so severe; especially on the exhaust valves, as the pressure has nearly reached zero by the time they are opened, and low pressure means low heat.

The economy of this system is undeniable, as it obtains a much greater expansion from the explosion, accomplishing what the compound engine was designed to do, but without all the complications, and port and friction losses of the latter. Besides the added economy due to using higher compression.

The tight crank case should hardly be necessary for our work. "Up above the world so high" we should not be bothered with the dust, and an open crank gives not only lighter construction, but also greatly assists in cooling, as it allows the cool fresh air to get up inside the cylinder and around the piston. In this case, of course, direct lubrication has to be provided, as the splash system is out of the question. The crank shaft cylinders and cam shaft supports may be of skeleton construction, while the crank shaft should be of a very liberal diameter, bored out hollow and mounted upon ball bearings. The cam shaft should also be mounted in a similar manner. These shafts should be made of chrome nickel steel.

The cylinders may preferably be made of nickel steel of about thirty per cent. alloy, which is rust proof, and also has the reputation of being a good anti-friction metal. It certainly stands heat well, as is proven by its wide use for valves, thirty-five per cent. composition being usually used for that purpose.

Many engineers at the present time are designing their engines for this purpose with staggered cylinders set in V form, relative to one another. This has an advantage for air cooling, where the engine is set fore and aft, as it allows the air to circulate around the cylinders better, the position being a very bad one for those that are set directly behind one another. The V form also has the advantage of shortening the length of the engine, and consequently saving slightly in weight. I should prefer, however, a typical six cylinder engine design, as it is better balanced, and more symmetrical in every way, and if there is anything I do dislike, it is an unsymmetrical piece of mechanism. The disadvantage in cooling may be overcome by setting the engine crosswise, and gearing to a transverse shaft by means of bevel gears located at the center of the crankshaft; or, the engine may be placed in the usual transverse manner and a scoop arranged on one side to catch the air from the front and cause it to strike the cylinders roadside on. This would probably be the better of the two methods.

The lightest of all methods, however, is the revolving cylinder type, the cylinders act as a flywheel, and their cooling properties are ideal. This type of engine has been used to same extent on automobiles, one company have had it upon the market for several years. It appears to me, however, somewhat on the order of freaks, although I must confess that I cannot put up a very strong argument against it.

With a six cylinder engine the propellers will probably take the place of a flywheel, thus lightening the engine to that extent.

The connecting rods should be made of rolled material, chrome-nickel or vanadium steel, being blanked out from heavy sheet metal, the central portion being given an I beam section by milling out a wide shallow groove on each side. The lower end should be designed to retain a ball bearing, while the

upper end should be adapted to retain a bronze bearing for the wrist pin. Both ends may be fitted up in a thoroughly mechanical manner, although at first sight it might not appear so.

The piston and rings should be made of cast iron, as it is the most satisfactory metal for this purpose. This, as well as the connecting rod, should be made up to the limit of lightness, for, to a large extent, the speed of the engine is limited by the weight of these parts, and "speed is power." As the motion is reciprocating and has to be reversed twice during every revolution, this gives a very hard blow each time upon the crank pin and wrist pin bearings. This is another argument in favor of the long stroke engine, as the blows are proportionately less frequent, but are also lighter as there is a longer travel during which the change of motion is made.

One thousand feet per minute is considered a conservative piston speed in automobile practice. This probably should not be exceeded in aerial work, for the latter is so much more severe, full load and highest speed being kept on continuously. This factor should be kept fully in mind when designing an engine for this purpose, and the engine should consequently be rated more conservatively.

The valves should be located in the top of the heads. Each cylinder having one large mechanically operated one for the exhaust, and two, or more, small automatic ones for the intake. The two small automatic valves are quicker operating and can be more conveniently located than a single large one. With the latter, the head has to be made of considerable larger diameter than the cylinder especially to accommodate it, unless they are placed at an angle.

I should preferably use the jump spark system of ignition with a single coil and distributor, the coil wound for a single cell of storage battery. A cell good for several hours use need not exceed one pound in weight.

Exhaust pipes and muffler may be dispensed with as luxuries for the future generation to adopt.

The carbureter may be made up of sheet metal construction so as to be very light.

GORDON-BENNETT INTERNATIONAL AERONAUTIC CUP RACE.

Owing to difficulty in securing the necessary amount of gas on Saturday, October 19th, the race has been postponed until the following Monday at 3:30 o'clock.

It is not unlikely that the Spanish entry will also be shut out of the race by the action of the Federation, leaving but three foreign clubs to compete: Aero Club of France, Deutscher Luftschiffer-Verband and Aero Club of the United Kingdom. M. Mix and M. Chas. Levee will be the companions of pilots Le Blanc and Gasnier respectively, composing the French team. Mr. Griffith Brewer will be the only representative of the English Club. If the Spanish entry is not admitted there will be but nine balloons in the race.

Just after the Gordon-Bennett race the St. Louis Club will hold a series of contests for dirigibles, and "gasless" machines if same can be secured. They plan at present to offer $5,000 in all, divided as follows: $2,500 to the dirigible or gasless machine covering a six-mile course in the best manner in 30 minutes; $1,250 to the dirigible which makes the best showing; $1,250 to the gasless machine giving the best account of itself. Should none of the competitors win first prize of $2,500, it will be divided equally between the dirigibles and gasless machines, each class receiving $1,250.

MANAGEABLE BALLOONS.

Until the year 1903 the use of manageable balloons was confined to scientific men and for the purpose of sport, but since then they have been found useful for strategical purposes.

The famous French engineer, H. Juilliot, having made several ascents in the balloon "Lebaudy" (constructed by himself) has also proved that they will render valuable assistance in times of war.

In consequence of the success of these experiments the French Government has purchased a similar balloon from the firm Lebaudy Bros. in 1906, to which they have assigned the name "Patrie." The firm of Lebaudy Bros. had ere this presented the balloon "Lebaudy" to the Government.

The "Patrie" is somewhat larger and quicker than the "Lebaudy," and particular care has been taken by the builders to bring it up to date with all the latest improvements that their experience has taught them.

The trial trips of the "Patrie" which took place in November, 1906, have fully established the fact that this can be considered the proper type of manageable balloon.

But to return to the "Lebaudy," which has been completely renovated since it made the descent on the 20th of November, 1903, which caused it a little

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damage; this balloon has a volume of 2,950 cubic meters, the diameter at the Maitre-couple being 10.30 meters and its length is 57.75 meters.

The fabric of these balloons consisted at first of two layers of cotton, one of which was painted yellow (yellow being the only color which will withstand the sun's rays) with a sheet of rubber in between. Now, however, another sheet of rubber has been used, same being placed on the inner side of the layer of cotton in order to make it stronger and to protect the fabric from the inroads which impure hydrogen gas makes. This impure gas caused much damage to the fabric which was first used. Since this time, however, the manufacturers have been successful in obtaining pure hydrogen gas in their factory at Moisson.

Great stress should be laid upon the fact that in the four years (1902-1905) no less than 75 ascents were made in the "Lebaudy" without an accident to a single person.

In the ascents made in 1905, one officer at least always accompanied the aeronaut, as also at different times did several Generals and the Minister of War.

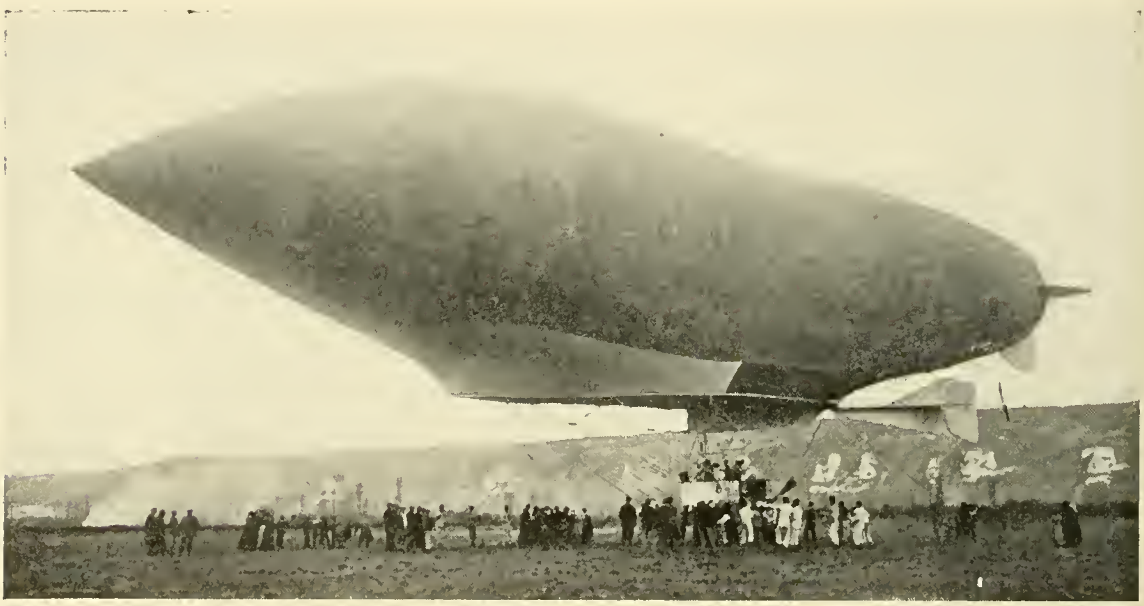
In addition to this these balloons have the following advantages:

Their easy management, their ability to withstand all climatic influences, their great carrying capacity, the safety with which ascents can be made, as also the returns to earth, and their usefulness in allowing photographs to be taken from great distances, and for the throwing of explosives.

All these have built up for these balloons an unbroken link of experimental successes and improvements which offer good proof that they can travel a distance of 100 miles around, provided that the natural surroundings offer sufficient protection to render the balloon invisible to the enemy, and that a good watch is kept.

Perhaps it would be advisable in the future to provide special places for these balloons in camp.

The ascents made at Toul (France) have proved that these balloons will play a great part in sieges, viz.: they will be very valuable in making reconnoissances, because they will be able to discover the position of an approaching army, to watch its camp, to obtain photographs of its fortifications and to



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keep the besieged in touch with the outer world. Whether the dropping of explosives from these balloons into the enemy's camp will be successful in effect remains an open question for the present.

On the other hand they are placed at a disadvantage because of their being exposed to the sight of the enemy and to their tendency to break down, but their freedom of motion in any direction would enable them to escape this former danger.

It has not yet been determined to what height these balloons can rise so that the enemy could elevate their guns to a proper angle.

The matter of fact is that the safety of the balloons in reality depends upon the tactics employed by the aeronaut.

But in any case the trials of the "Lebaudy" as mentioned above fully prove that the balloons can be rendered most valuable in assisting in times of war and it appears to us that in the not very distant future it will be able to establish fleets of these airships, of which "Patrie" may possibly be a foundation.

The Continental Caoutchouc and Gutta Percha Co. of Hanover, Germany, has the representation for the United States.

THE SCIENTIFIC AMERICAN FLYING MACHINE TROPHY.

A special committee of the Aero Club of America, appointed for the purpose, has formulated the following provisional rules governing the competition for flying machines of the heavier-than-air type, which will be inaugurated at the Jamestown Exposition on September 14 next.

It is the intention of the Scientific American, in offering this trophy, to have it always open to competition by inventors the world over. Should the trophy be won by the representative of a foreign aeronautical club, this club, if a member of the Federation Aeronautique Internationale, may become the custodian of the trophy; but the future competitions, even if held abroad, shall be carried out under the same rules and conditions used by the Aero Club of America in the competitions held here.

Next month's issue will contain a photograph of this beautiful trophy, which is now in course of manufacture.

Rules Governing the Competition.

1. This competition will be held annually, and the conditions of the trials will be progressive in character, so as to keep abreast of the state of the art. The first contest will be held at the Jamestown Exposition on September 14, 1907, and all entries for this contest must be made in writing and sent to the secretary of the Aero Club of America, 12 East 42d Street, New York City, prior to September 1, 1907. The rules governing future contests will be formulated by the contest committee of the Aero Club of America in accordance with the results obtained and the lessons learned in this first contest.

2. All heavier-than-air machines of any type whatever (aeroplanes, helicopters, orthopters, etc.), shall be entitled to compete for the trophy; but all machines carrying a balloon or gas-containing envelope for purposes of support are excluded from the competition.

3. The machine which accomplishes the required flight in the shortest time and with the best display of stability and ease of control, shall be declared the winner. If several machines perform equally well, the committee shall have the right to demand further flights in order to determine which is the best. If no machine makes the required flight on the date set for the contest, the one that subsequently first accomplishes such flight shall be declared the winner, and shall not be entitled to make a further flight until the next year, under the changed conditions of the contest.

4. The flights shall be made in calm air, if possible. If a wind of over 20 miles an hour is blowing, no trial need be made. Aeroplanes may start by running along on wheels on the ground under their own power, but no special track or launching device will be permitted. A smooth, level roadway, or a reasonably smooth, turfed field will be provided from which to make the start. Machines need not fly more than a few feet above the ground, or higher than is necessary to avoid obstacles. They should be capable of being steered both horizontally and vertically, and of alighting without being damaged. If there is a wind blowing, the flights shall be made in such direction as best suits each operator. The start should preferably be made against the wind.

5. The committee shall make arrangements to accurately time and measure all flights, as well as the distance traversed and time taken in starting and stopping. Accurate observations of the speed of the wind and other weather conditions at the time of the flight shall also be made and recorded by the committee. Complete specifications of the competing machines, giving weight, supporting surface, details of motors and propellers, etc., together with a description of any performance that the machine has made, shall be

forwarded to the contest committee with the entry or when application is made for a trial.

6. Anyone desirous of making a flight at any subsequent time can arrange for such a test by communicating with the contest committee of the Aero Club of America, at least fourteen days in advance, and asking this committee to appoint a suitable time and place for the trial. If the committee believe the machine to be impractical, it can require the inventor either to prove the incorrectness of such belief by an informal demonstration with the machine itself, or by demonstration in some other satisfactory way which will show that the machine is operative.

7. The first flight shall be for a distance of one kilometer (3,280 feet) in a straight line.

8. After every competition, the name of the winner will be inscribed upon the trophy. If it is won three times in different years by any competitor, the trophy will then become his personal property.

BALLOON VOYAGES.

By M. Montgolfier.

It is said, with great mistake, that trips in free balloons are dangerous and very expensive. This is not so. It is proven that since the materials of which free spherical balloons are made have been perfected, there is now no more danger. Since the great aeronautical display of 1900—since aeronautics have ceased to be the field of acrobats and showmen alone and has become a sport and a scientific mode of investigation, there has not been recorded in France one single accident in free balloons. That is because ascensions to-day are made by enlightened people who have learned technical aeronautics.

The Aeronautique Club de France has greatly helped in this work of popularizing ballooning by its publications, ascensions, fetes, competitions and lectures. This Club has a library, with a reading room, a park for aerostation and one for aviation. By means of small assessments the members have the privilege, in turns, without any expense, of making balloon flights, and, further, they have all the facilities to make as many ascensions as they wish, with the minimum of expense. Every member receives the official journal, La Revue de l'Aviation. Ladies are allowed to become members of this Club, forming the Ladies' Committee, and have the same privileges as all other members.

Numerous are those who have already experienced the charm and enthusiasm of an excursion in the air and all are unanimous in their declarations of the apparent immobility of the car—there exist no trace of uneasiness. Vertigo is impossible even to sickly people, one does not feel a breath of air, not a movement, nor the sensation of going up or down, not even the one of travelling. The voyager is entirely taken up in admiration, and with the ideal beauty of the landscape. Concerning the uncertainty of landing, of which the profanes speak—it is a fable, for one can land when and where he wishes, and more gently even than in an elevator. In modern ballooning the "dragging" does not exist any more. (On account of the use of the rip-cord.—Ed.) The work of this Club can not be too much encouraged. It is subsidized by the City of Paris and is placed under the patronage of the Minister of Public Instruction. It has not only democraticized aerial excursions in placing them within the reach of all, but has done much in technical researches of the highest interest and value. It has a school where are prepared men for entrance in the First Ingenieur Battallion Balloon Corps, at Versailles. This preparatory school sends out each year a great number of men, well instructed and esteemed by their superiors.

AERO CLUB OF AMERICA.

To Members:

Will you not kindly send the Club accurate records of all ascensions made in order that our file may be complete? The number of our delegates to the International Congress is directly dependent upon the number of trips made. As a matter of Club interest every one is urgently requested to promptly report their voyages, and as detailed as possible. Blanks will be supplied to those who have not already received same.

AUGUSTUS POST,
Secretary.

New Members:

Frederic W. Lord, President Lord Electric Co., 213 W. 40th St., New York.
Dr. J. Wesley Bovee, Physician, 815 Conn. Ave., Washington, D. C.
Lee S. Burridge, President Sun Typewriter Co., 317 Broadway, New York.
William Gettinger, Publisher, 51 Nassau Street, New York.

Messrs. Cortlandt Field Bishop and Frank S. Lahm have been appointed delegates to the Conference of the International Aeronautic Federation, Brussels, September 12.

THE AERO CLUB OF THE UNITED KINGDOM.

By Harold E. Perrin, Secretary.

The Race for the Hedges Butler Challenge Cup took place at Ranelagh on Saturday, June 29th, 1907. The following balloons competed:

Name of Balloon.	Competitor.
Aero Club IV	V. Ker-Seymer.
City of London	F. H. Butler.
Venus	J. T. C. Moore-Brabazon.
Britannia	Hon. C. S. Rolls.
Nebula	Hon. Mrs. Assheton Harbord.
Kokoro	Prof. A. K. Huntington.
Lotus	G. Brewer.
Sapellite	Viscount Royston.
Pegasus	Col. J. E. Capper, C.B., R.E.
Enchantress	E. Bucknall.

The start was made in a heavy thunder storm, and most of the competitors were driven down by the very heavy rain. Col. J. E. Capper, C.B., R.E., accompanied by Major Crookshank, made the longest journey. Having got clear of the thunder storm, he continued his journey down to Bramber, near Worthing, where he was obliged to make his descent, as the wind was carrying him directly over the sea. All the other competitors made their descent quite close to the starting place. Col. Capper therefore holds the Hedges Butler Challenge Cup for this year. The rules for this Challenge Cup stipulate that in the event of any member winning the Cup on three consecutive occasions it will become his absolute property.

Mr. Cortland F. Bishop, president of the Aero Club of America, and Mr. Alan R. Hawley, one of the team representing the Aero Club of America in the forthcoming Gordon Bennett Aeronautical Race, have been elected members of the Aero Club of the United Kingdom.

Mr. Hawley, who has been making several ascents both in Paris and in England, competed for the Hedges Butler Challenge Cup in conjunction with Viscount Royston. Owing to the bad weather, they were only able to make a short trip, but succeeded in winning the second prize, being a cup offered for the second longest journey by the Ranelagh Club.

AERO CLUB DE BELGIQUE.

An International Balloon Contest for distance will be organized by the Aero Club de Belgique on the occasion of the reunion, at Brussels, of the F. A. I. and the Commission Permanente Internationale d'Aeronautique, on Sunday, September 15. It will be held in the Park du Cinquantenaire. Several prizes, the majority of which are important, will be given the winners in this inter-club race.

AERO CLUB OF FRANCE.

Georges Besancon, Secretary.

The first half year of 1907 has been marked by numerous ascensions, which show the growing interest of our society for the encouragement in aerial navigation and the allied sciences.

In the splendid park of the Aero Club among the hills of Saint Cloud from the 1st of January to the 30th of June there were no less than 191 departures of balloons, consuming 172,480 cubic metre of gas and lifting 511 passengers, of whom 54 were ladies.

These ascensions were distinguished by the aerial voyages of: Prince Albert of Belgium; Mr. Louis Barthou, Minister of Public Works; General Picquart, Minister of War; and three ascensions of officers of the engineering corps that are called to drive the future war balloons.

The annual club book of the Aero Club of France for 1907, which is to-day mailed to all members, is now a large and thick book of over 200 pages. An extract of this book is mailed to all persons asking for it. Said extract gives all inquiries and answers many questions concerning the advantages given to the members and can be had free of charge by writing to the office of the Aero Club, 84 Faubourg Saint Honore, Paris.

Aviation at Touquet.

These last days, with a good north-west wind, MM. Leon Delagrange, Charles Voisin, Henry Farman and Colliex made quite a few trials in soaring over the dunes of Touquet.

Starting from different heights, varying from 10 to 15 meters, with a motorless aeroplane, Chanute model of about 18 square metre of surface, the experimenters realized some flights of 40 meters.

The experiments in soaring shall be continued on the same shore, which is good and practicable for this kind of work.

AERONAUTIQUE CLUB DE FRANCE.

By Monsieur J. Saunière, President.

At the last meeting of the Board of Governors it was decided to give free of charge to members who desire it, 500 cubic metres of gas to be used in ascensions. Four balloon ascensions have been arranged for the week of July 21-28 at the Rueil gas works, the pilots to be designated for each trip, without any expense to the members.

THE DIRIGIBLE BALLOON.

By Israel Ludlow.

To make a successful flight in a dirigible airship is one of the most difficult problems presented to the aeronaut. In the first place there are many points to be noted in the building of an airship.

The choice of a suitable motor is the first essential. Unless the motor is of minimum weight and maximum power the gas envelope will be unable to lift it off the ground. Not only is the smallness of weight to be taken in account, but it must be of the greatest effective power, safe driving and length of working time.

The choice of a suitable propeller is hardly of less importance and can only be made after thorough tests, in connection with the particular motor. Propellers of large driving power do not always create the most breeze when revolved.

Then the framework offering little resistance and having the smallest possible compass must be constructed and the motor and propeller rigidly attached; and after that is done the framework itself must be scientifically and carefully hung to the balloon so that when the engine is working and the propellers revolving the oscillations, due to the vibration of the motor and the velocity with which the airship moves, are as small as possible.

The weight of the aeronaut must be considered, and the air resistance his body offers in traveling are not unimportant points.

The gas envelope must have the smallest practical cross section. Since the shape of the envelope must be the thing that is to be figured on under all circumstances, the diameter can be determined only after each individual item is figured up, and the mathematical result obtained, which is the basis of the construction work. The shape of the envelope must offer the least head and side resistance, while possessing at the same time the greatest volume and the greatest longitudinal stability, incompatible elements that must be carefully harmonized. Everything must be made light to the breaking point, and under these circumstances it is not surprising that accidents continually happen, due to the changing wind, to striking obstructions in ascending and descending, and to the irregular action of the motor, or from the loss of gas, due to condensation, and sometimes from the carelessness of the aeronaut.

Having knowledge of these different sources of accidents the public should view the effort of the aeronaut with consideration. If they are interested in the matter scientifically they should observe the five points of construction and see where the aeronaut has put the centre of gravity of his ship; and its relative position to the centre of resistance; or how he has put the point of application of the driving propeller, and what method he uses to prevent any turning movement between the driving force and resistance, of how the distribution of the lifting forces is used in connection with the distribution of weight along the framework; of the system by which the aeronaut raises and lowers his airship by moving his own weight forward and backward; and the movements to one side and how the equilibrium is preserved. The entire safety of the aeronaut depends upon his careful calculation of all these points, and the angle or tilt that can be made with safety.

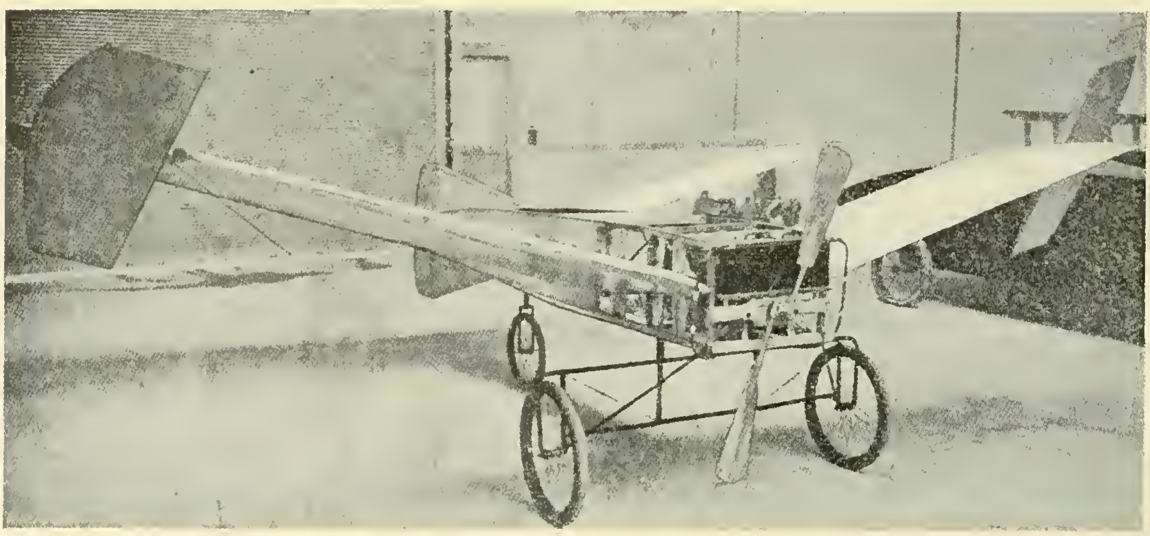
Changing the direction of flight causes a bending and strain; traveling through the air forward, a horizontal strain, and pitching of the airship an unequal strain. Results must be obtained by the use of a rudder; otherwise he is at the mercy of the wind.

A practical system of aeronautical navigation has not yet been put into practice, due to these difficulties, of which only a general idea is here given; improvement is rapidly made and each flight shows the possibility of building a more perfect airship.

The flights of Eugene Godet with his cylindrical gas bag with conical ends are interesting because they are among the initial efforts of man to perfect the practical airship, which is destined to bring such important changes in science, sport and war. It is only within the last few years that powerful and light motors capable of driving the huge gas bags through the air have been available.

These light engines, weighing only two to five pounds per horse power, have come into existence because hundreds of thousands of dollars have been spent on them by automobile manufacturers and aerial scientific work has profited immensely accordingly.

The aim of aeronauts generally is to make airships capable of accomplishing long voyages and at great speed. A balloon may use different air currents in various strata of the atmosphere, but an airship with a good motor can go with or against the wind in any desired direction.



GODET'S DIRIGIBLE AT JAMESTOWN EXPOSITION.

Eugene Godet has suspended a triangular bamboo frame directly from the envelope by means of strong cordage; he has made his gas bag long and in proportion to the width as 6 is to 1. The rudder is placed in the rear and the propeller in front.

One of the huge iron-clad warships now anchored in Hampton Roads is an engine of destruction that had it been brought into existence fifty years ago could have conquered the world. There is no doubt that the next fifty years will see the development of the aerial warship, which will make the iron-clad of today as far out of date as the wooden hulls of our fathers. A duty rests upon those charged with official responsibility to investigate more fully the possibilities of aeronautics.

Great Execution Possible.

The Hague Conference in 1900 adopted a resolution to be in force for five years declaring that missiles should not be thrown from balloons, owing to

the liability of injuring non-combatants. This regulation has expired and there is little likelihood of its ever being renewed, since there have been great improvements and almost perfection attained in the construction of dirigible airships by the War Departments of France and Germany, who were the foremost advocates of the Hague resolution.

A question of overwhelming importance is: Shall the Government of the United States be a laggard in the development of this branch of the military service?

In land and naval warfare a balloon or airship may be used to discover the strength and advance of the enemy, even from great distances, or when their attack is from submarine boats, for be it known that in looking down into the water from a balloon objects in its depths become visible. Aerial devices may be employed for signalling between distant points, and to improve the advantage wireless telegraphy gives. Harbors and other navigable waters may be explored and superior effectiveness may be given to artillery and naval fire.

The cost of a modern warship is about six or seven millions, but a warship is but paper if attacked from above. Forts have no protection if missiles are shot with accuracy from an aerial station. It would be very easy to send up a captive balloon from the aeronautic concourse of the Jamestown Exposition to the height of one mile, where it would be safely out of the range of Fort Monroe and all the guns of the warships anchored in Hampton Roads. Yet from this point of vantage dirigible balloons, like that of Eugene Godet, carrying high explosives instead of an aeronaut and guided by much the same method as marine torpedoes are, could be launched unerringly against the warships and the neighboring forts and cause the destruction of property to the extent of hundreds of millions of dollars.

POOR GAS AT PITTSFIELD.

The ascensions made this year from Pittsfield have been most unsatisfactory on account of the very poor quality of gas supplied. In no case has it been possible to carry more than one or two bags of ballast. In some cases no ballast was carried and no instruments. Furthermore, the gas company says it cannot supply gas after 10 o'clock in the morning. The last instance is the ascension of William F. Whitehouse and A. L. Stevens on August 1. Arrangements have been made by Mr. Stevens with E. C. Peebles, Superintendent of the gas works at North Adams, to make his ascensions in the future from that place.

A WORD OF ENCOURAGEMENT.

A subscriber writes: "The 'American Magazine of Aeronautics' is especially welcome at this time when so much interest is manifested in aeronautics, both as a science and a sport. The magazine ought to be read by every aeronaut and everybody interested in the advancement of the science. America has long been in need of just such a magazine —a paper giving all the current events in this field of science.

"A few years ago a periodical on aeronautics made its appearance in Ohio but it lasted through only one volume. * * * A vacancy has long been existing in our list of scientific periodicals but this vacancy has been filled by the 'American Magazine of Aeronautics.'"

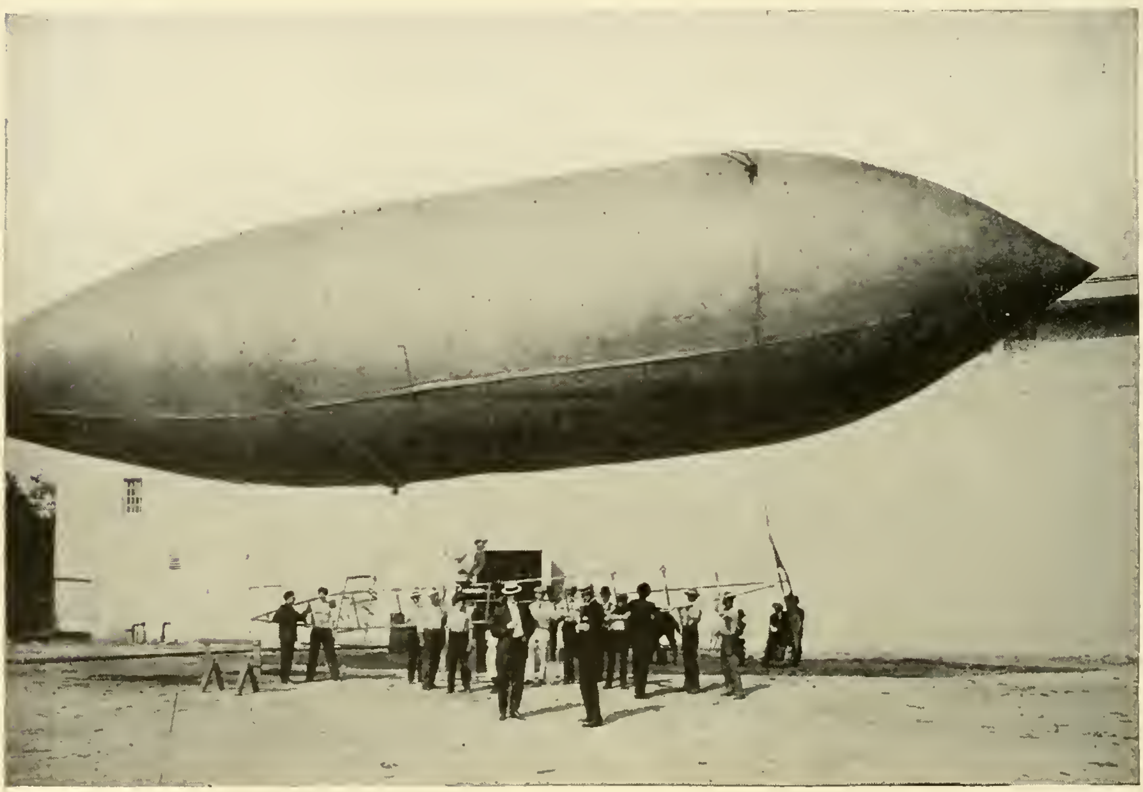
THE NEW BLERIOT MACHINE.

From "L'Automobile."

Bleriot made some very interesting trials with his former machine but it did not render all the satisfaction the inventor anticipated, especially in regards to the stability. He was not discouraged by such trifles and with perseverance, the only means to success, constructed a new machine entirely different from the former one.

The new soaring machine is of the Langley type. It is composed of a rectangular frame, pointed at the rear, and at each end are fixed 2 planes forming between them an obtuse angle.

In the front of the frame is placed a 24 HP. Antoinette motor with the propeller. The pilot has within easy reach a very ingenious handle allowing him to operate separately or simultaneously the two rudders placed at the extreme ends



GODET'S DIRIGIBLE AT JAMESTOWN EXPOSITION.

of the 2 front wings. The pilot is seated inside of the frame, at the rear of the machine, in rather narrow quarters, only the upper part of his body being visible.

This soaring machine is placed on 3 wheels. The surface of the wings is 17 square metres; the weight is 250 kilos.

In the early morning of July 13th, Bleriot proceeded to experiment with his new machine at Bagatelle. At about half past seven his first experiments had not proven very successful and with the propeller advancing at the rate of one metre, 1 metre 10 centimeters and 1 metre 40 centimetres per revolution, he did not succeed in raising the machine from the ground.

Bleriot then gave up the experiments under the impression that the front of his machine was too heavy. This excellent engineer will no doubt be obliged to enlarge the surface of his front wings but he anticipates attaining interesting results with the new soaring machine now in construction, a machine equipped with a 50 h.p. motor.

CHRONOLOGY OF RECENT EVENTS.

June 29. Ten balloons start from Ranelagh for the Hedges Butler Cup. Hon. C. S. Rolls' balloon "Britannia", in ascending, struck the "Nebula", disabling it for the contest. Mr. Alan R. Hawley was a passenger in Viscount Royston's "Sapellite". The longest distance was accomplished by Col. Capper in his balloon "Pegasus," landing at Bramber, near Shoreham. A thunderstorm occurred at the time of the start and the aeronauts had varied exciting experiences.

July 3. The French Government dirigible, "La Patrie" makes a sensational and most successful trip over Paris.

July 5. M. Vuia makes a trial of his new aeroplane. The machine rose to a height of five meters when it inclined and fell. The propeller and some tubing were broken.

July 6. Major von Grossi's dirigible, it is reported, makes some highly successful trials at night, maintaining a speed of 30 miles an hour.

July 6. Twelve balloons race from Paris under auspices of the Aero Club of France. Messrs. Leblanc and Gasnier, the French representatives in this year's Gordon-Bennett Race, secured Third and Fourth Prizes respectively. Mr. Alan R. Hawley was a passenger in Levee's balloon and secured fifth place, landing in Bavaria, near Saarbruck, a distance of 368 kilometres. The longest distance was made by M. Bachelard, 601 kilometres.

July 7. Beachey makes a very successful flight from Luna Park, Washington, in his dirigible, alighting on the Munsey Building, after circling it. After a stop of an hour, he resumed his journey, sailed around the Washington Monument, and back to the start.

July 7. Thirteen balloons race from Liege under the auspices of the "Liege-Attractions" and organized by the Aero Club de Belgique.

July 14. On the occasion of the French national holiday, "La Patrie" sails over the marching troops in the review at Longchamps.

July 17. The Bleriot aeroplane flies a distance of 80 yards. The machine was slightly damaged in alighting.

July 22. Premier Clemenceau and General Picquart, the Minister of War, makes an ascension in the Lebaudy dirigible, "La Patrie" from Meudon to Paris and return by way of Issy and Les Moulineaux. The Minister has asked the War Department for $1,000,000, it is said, to be devoted to the building of a corps of twenty military airships and attached to the various fortresses, the first five being delivered by March, 1908.

July 26. The Bleriot aeroplane makes a successful flight at Issy. A distance of 125 yards was accomplished in a straight line at an altitude of about 15 feet, followed by a long curve of 165 yards.

July 29. A German military airship makes a flight of an hour's duration over Berlin, and disappearing in the direction of Tegel against a 12-mile breeze.

NOTES.

Mr. Otto Luyties, of Baltimore, who has been experimenting for a considerable length of time with a machine of the helicopter type, both individually and in collaboration with Prof. Wood of Johns-Hopkins, has nearly completed a full sized machine calculated to lift one person in addition to the operator.

In an interview with Mr. Luyties he said: "Some little laboratory work was done, but the most of the work has been with the large machine. The ratio of supporting power to horse-power has been found not to be directly proportional to the diameter, or other known function; and for this reason it is impossible to accurately compute the dimensions of a successful large machine from laboratory experiments. For this reason I have done more of my work on the large machine. Machines having high horse-power have the advantage that the weight of the operator is relatively small. Many experimentors have taken great pains to make their, say, 10 horse-power engine weigh four pounds or less to the horse-power. Now, an operator weighing 150 pounds would burden such an engine with 15 pounds to the horse-power, whereas, in a large machine, of, let us say, 100 horse-power, the operator would burden the motor with only 1½ pounds to the horse-power. Therefore, in large machines extremely light construction of the engine is not so essential. As a matter of fact, though, large engines can be made to weigh less per horse-power than small ones.

"All the above features favor experiments on a large scale, in addition to the fact that machine work of moderate quality is relatively more accurate. The principal purpose of my experiments is to obtain data on a large scale for the future construction of helicopters. I intend to continue work along this line if the results of my experiments warrant it."

As a reminder of their pleasant balloon voyage together on July 12, Colonel Max C. Fleischmann has presented Mr. A. L. Stevens with a handsome silver flask.

The attitude of the International Aeronautic Federation in shutting out the Italian and, possibly, the Spanish entries in the Gordon-Bennett race for this year is certainly not in accordance with the generally accepted code of sporting ethics. Where there is a misunderstanding or delay in entering races, owing to unfortunate information, it is usually considered only just to make exceptions and admit the applicants. Such action is sportsmanlike, but the action of the I. A. F. is anything but that. Of course, the reason given is that the applicants did not comply with the letter of the rules. The result of this action is that it gives the French four more chances of winning the cup.

The phenomenon of St. Elmo's fire was witnessed by Alan R. Hawley, Frank R. Cordley and Chas. Levee on their trip from St. Cloud on the 20th of June. At the height of about 1100 metres the light appeared at various points on the netting and rigging, lasting about fifteen minutes.

The U. S. War Department has another new balloon, of 95,000 cubic feet capacity, awaiting test at Fort Omaha. A very complete hydrogen plant has been erected and it is expected to produce this gas at a cost as low as that of coal gas. The plant also includes an aerodrome and shops. Special attention will be given to aerial photography, using telephoto lenses.

There are now two balloons called "St. Louis," and the incident has caused considerable question in France, where Mr. Hawley's "St. Louis" has just made its trial trip. The other "St. Louis" is owned by Mr. Russell E. Gardner, a member of the Aero Club of St. Louis. Mr. Gardner's balloon was named some time before Mr. Hawley's.

It is reported that Japan has ordered ten military balloons of a German concern.

Wilbur Wright made his first balloon ascent of record at Paris on July 17 in company with Alan R. Hawley.

Count de la Vaulx is building a large dirigible for military purposes, the envelope to contain 3,000 cubic metres of gas. The main object will be perfect dirigibility. The airship can be easily taken apart and packed in four cases and transported from place to place, while the Lebaudy must operate from a fixed base. The speed estimate to be possible of attainment is 25 miles an hour in calm air.

Joseph A. Blondin, of Albuquerque, N. M., has ordered from A. L. Stevens, the balloon manufacturer, a 30,000 cubic foot captive balloon, with outfit.

Samuel G. King, a Philadelphia aeronaut, has practically completed the "Ben Franklin," a balloon of 92,000 cubic feet. The initial ascent is to be made shortly. This will make Mr. King's 451st ascent.

We have received some very interesting toy flying machines from Mr. William Morgan of Fort Plain, N. Y. They are of paper, aeroplane type, with two propellers in front. They fly very well.

The French team in the Gordon-Bennett sails for America on September 28th, on the "Provence."

Gail Robinson, sailing one of Knabenshue's airships, dropped from an altitude of several thousand feet on July 13 at Springfield, Ohio. In order to facilitate his returning to the starting point he allowed the ship to ascend to a considerable height, where he was struck by counter currents of air. The propeller was forced against the end of the envelope, ripping it open. Robinson climbed out and seized the sides of the tear with his hands, the weight upending the ship and parachuting to the ground. The engine was smashed.

The Wellman expedition may be delayed somewhat by reason of the damage done to the balloon shed at Spitzbergen by the recent heavy storm. The airship was uninjured and the start may be made the first part of August.

The aeronautic exhibit at Jamestown Exposition is attracting considerable attention. Two more airships have been placed on exhibition, another balloon, a hydrogen plant and the famous Herring glider.

The trials of the machine now building by the Vacu-Aerial N. & M. Co., of Milwaukee, have been delayed in order to strengthen certain parts and to obtain a suitable propeller. The machine is practically finished, however, and a trial flight is expected in the near future. The company is most enthusiastic over the prospects.

A. C. Benades and three assistants were seriously injured on July 20 by an explosion of hydrogen while handling a dirigible.

England now owns the largest free balloon, "The Mammoth," of 106,000 cubic feet capacity. A trial ascent showed that its size was distinctly an advantage. Other large balloons: in 1889 a 107,000 cubic foot balloon made a free flight, carrying twenty people; "La Patrie," the French dirigible, contains 108,000 cubic feet; the Leipsig balloon of 110,000 capacity remained in the air with eight passengers for over twenty-four hours in 1897; Andree's balloon was of 160,000 cubic feet; the "Geant," whose ill-fated trip in 1863 will be recalled, held 215,000 cubic feet; Walter Wellman's new dirigible has a capacity of 265,000 cubic feet; the London captive balloon of 1869 held 424,000 cubic feet; the airship of Graf von Zeppelin has a capacity of 360,000 cubic feet; Godard's "Montgolfier," which made a couple of ascents in 1864, contained 500,000 cubic feet. The largest balloon ever built—a captive—was one at Paris in 1878 which had a capacity of 875,000 cubic feet.

Signor Usuelli, the well-known Italian aeronaut, has added another over-the-Alps trip to his record, rising to a height of 6,800 metres at one point. The landing was made near Bolzana in the Tirol. The Queen Margherita of Italy has this year offered a prize for a balloon trip over the Alps, provided the aeronaut makes the passage between Chamonix and Tarvispass. Flights over these mountains are rather dangerous and necessitate rising to at least 5,000 metres. Usuelli and Crespi have heretofore held the records and will make especially strong attempts this year to win the Queen Margherita Cup.

Mr. A. B. Lambert of St. Louis has returned from Europe and is telling his friends of his balloon trips while abroad.

The Parseval dirigible has been found by the German Government to be better adapted for its purpose than the Lebaudy, which they attempted to purchase some time ago. Major von Parseval has been permitted to resign from the army in order to take up more actively aeronautic study.

Mr. Charles J. Glidden, founder of the Glidden Tour, has become actively interested in ballooning and will shortly go abroad.

A. Roy Knabenshue has completed a new dirigible, the largest in this country. The envelope measures 105 feet in length by 17 feet in diameter. The frame is 45 feet in length. A 16 horse-power 54-pound motor drives two propellers placed one on each side amidships. The net is done away with, the weight of the frame and motor being supported by hempen rigging attached direct to the envelope in the manner known as "side suspension."

Frederic Longwell, of Michigan City, Ind., is planning to build a combination dirigible balloon and aeroplane. The gas bag will lift 570 pounds of the 700 total. The planes below the bag are expected to force the machine into the air.

A special camera is being designed by the Goerz Optical Co. for use in balloons and airships. It will be of the "Reflex" type, self-contained, tele-photo lens, the making of an exposure automatically bringing into place the new film, with other novel features.

Count de la Vaulx is expressing himself in the public prints to the effect that "the aeroplane is useless except as a toy or for sport."

It is reported that Santos-Dumont has bet M. Archdeacon $10,000 to $1,000 that within 8 months he would make a motor boat travel 100 kilometres an hour; and in six months an aeroplane to fly 500 metres. "This wager arose as the result of an even bet of $10,000 by Archdeacon with Charron that May, 1907, would see a motor boat do 75 kilometres. Charron says Archdeacon would have won if business had not prevented devoting the necessary time to the construction of a boat."

Cromwell Dixon, the fourteen year old boy who, a short time ago, constructed a small dirigible balloon, propelled by his own energy, made a flight with it a few days ago which turned out to be rather exciting for the aeronaut. At the height of 2000 feet he discovered that he was still rising rapidly through shortage of ballast. He crawled along the framework to the valve and let out enough gas to start him downward. Starting his pedaling again he descended slowly, making a good landing.

G. H. Curtiss, the motor manufacturer, has been in Nova Scotia at Dr. Bell's experimental station placing a 40 horse-power 8-cylinder motor in a Bell tetrahedral kite.

Captain T. T. Lovelace is building a dirigible, the frame of which will be 45 feet in length, built of Shelby steel tubing 22 guage, 11/16 in. diameter, with kiln dried spruce forced inside. The 2-bladed propeller will be 10 feet in diameter, placed forward. A combination vertical and horizontal plane rudder will be balanced at some distance from the forward point. The envelope will be of Japanese silk, 15 feet in diameter by 90 feet long, side suspension, with a capacity of about 9000 cubic feet. A 2-cylinder 16 horse-power Peugeot motor from the Prospect Motor Mfg. Co. will supply the power.

THE HIGHEST ASCENT BY MAN.

To the Editor of the American Magazine of Aeronautics :—

I desire to correct an error which, through no fault of mine, appeared in Chapter IX, "The Balloon in Science and Sport," contributed by me to the Aero Club book, "Navigating the Air". On page 123, in speaking of the Berlin Aeronautical Society it is said : "About ninety ascensions have been made by its members, including an ascent by Professors Berson and Süring to the height of 34,000 feet ; *an ascent by Glasher, in which he claims to have risen to 37,000 feet*, the greatest altitude ever reached by man ; and a voyage of 53 hours, which is the longest time a balloon has remained in the air, by the Wegener Brothers." The words now italicized were not in the proof which I returned to the editors and were evidently inserted by them, because they thought that the off-quoted "record" of Glaisher (not "Glasher") had been forgotton. As a matter of fact, the insertion of these words is absurd, since Glaisher's ascent was made in 1862, 19 years before the Berlin Society was founded and of which he never was a member. Of more importance, however, is the fact that it does injustice to my colleagues, Professors Berson and Süring, who undoubtedly reached, in 1901, the record-height stated, whereas that attributed to Glaisher is now believed by authorities everywhere to be far too high. An account of Glaisher's memorable ascent, with the reasons for doubting his claim to have reached 37,000 feet, will be found in Chapter III of my book, "Sounding the Ocean of Air", in the *Romance of Science Series*, London, 1900.

On page 118 of my article in the Aero Club book there is a mistake in spelling the name of the late Professor Hazen, who has probably made the highest ascent in this country, although he rose to less than half the height attained in Germany.

A. LAWRENCE ROTCH.

NEW AERONAUTIC BOOKS.

DAS ZEITALTER DER MOTORLUFTSCHIFFAHRT. The writer of "Berlin-Bagdad," Rudolf Martin, treats of the advancement in aerial navigation by means of the dirigible balloon and its effect on the great powers as regards its use in war. Although the imagination of the author is somewhat stretched, the book is very interesting and will furnish food for considerable thought.

The subjects discussed are as follows: At The Threshold of The New Era, The First Presentiment of The Revolution, The Significance of The Revolution, The Abundance of Aerial Apparatus, Any Point Attainable, By The Shortest Way, With The Greatest Speed, With The Least Cost, With The Greatest Safety, The Ease of The Journey, Heavy Loads not Adaptable to Aerial Traffic, In Time of War, War on Land, War on Sea, War in Air, Transportation of Troops Through Air, Political Reaction, Greater Countries and Greater Commercial Unions, England an Island No More, Japan and America, France and Germany, The Advancement of Civilization. The book is published by Theod. Thomas, Leipzig, Germany.

THE PARADOX OF THE DIRIGIBLE BALLOON. W. Hampson, M.A., in "Paradoxes of Nature and Science," argues very effectively the hopelessness of aerial transportation by means of self-propelled gas bags. He says: "Swimming in a fluid-like air and swimming on a fluid-like water differ from traveling on the ground not only in the manner and means of support, but also in the fact that the fluid itself which supports the traveler may be and often is in rapid motion itself. When this is the case the contrivance for traveling is at the mercy of the supporting fluid, unless it can travel through the fluid as fast as the fluid itself is likely to travel. And to have real independence of movement it must be able to do a good deal more. It must be able to move through the fluid much faster than it is ever likely to find the fluid moving."

Even allowing to balloons the immemorial privilege of sailing ships, to "lie by" in times of hurricane, they must be swifter than strong winds, and even storms. To have to wait for days and even weeks, as they do now, till the wind has dropped to something like a calm before venturing out, is hardly to have accomplished 'the conquest of the air.' As well might a mouse boast of its conquest of the cat on the ground that, having waited till she was asleep, it had then crept out of its hole."

The comparison is somewhat harsh but the paradox of the practical dirigible balloon contains the following contradictory requirements: To be independent, or even safe, in a fluid as swift as the winds, it must be as swift as an express train. To resist the air pressure at such a speed it must be very strong, and therefore heavy. To float by its own lightness, it must be very large for its weight, and therefore weak. To move swiftly with so large a bulk it must have powerful and therefore heavy, motive apparatus. It must be, in four words, heavy and light, weak and strong.

The author describes the wing motion of birds, with diagrams, the action of the boomerang, and treats of aviation generally.

The book is published by E. P. Dutton & Co., 31 West 23d St., New York.

FUTURE EVENTS.

Aug. 18. Balloon Race at Bordeaux.

Sep. 12. Annual Conference of International Aeronautic Federation, Brussels.

Sep. 15. International Race at Brussels.

Sep. 29. Grand Prix at the Tuileries, Paris.

Oct. 21. Gordon-Bennett International Race at St. Louis.

Oct. 28-29. Aeronautical Congress at Jamestown Exposition.

Nov. 15. International Exposition of Aeronautic Photographs at Paris.

AERONAUTICS IN THE CURRENT MAGAZINES.

The *Scrap Book,* July number, contains a ten-page article by C. F. Carter, "The Flying Machine is Here; the principles upon which navigation of the air depends have been discovered and their successful application assured." The writer allows his imagination freedom in the first half of the story.

The second half is practically a resumé of what has thus far been done upon which prophesies for the future may be based.

McClure's for July; Walter Wellman gives a very complete description of the dirigible "America," in which he is now about to start for the Pole. Though the article is a technical one yet the ordinary reader cannot fail but be deeply interested in his plans and appreciate the unbounded faith of Mr. Wellman in his attempt.

Appleton's, in the August number, has succeeded in inducing M'Cready Sykes, the New York lawyer, who was so greatly appreciated at the Aero Club Banquet, to write most humorously some considerations of aerial law. The automobile of Judge Reardon, an American jurist sojourning in France, is caught by the anchor of M. Rambaud's aeroplane and jerked ungracefully through the air at high speed. Various complications swiftly follow. The story is exquisitely told and reveals the marks of a master hand.

AERONAUTICAL PATENTS ISSUED SINCE JANUARY 1.

Air ship, G. W. Byron	839,548
Airship, J. Meden	840,078
Airship, H. H. Johnson	840,339
Aerial navigation brake, G. G. Schroeder	841,581
Aerial transportation system, G. G. Schroeder	841,582
Balloons, car of navigable, P. H. Unsinger	842,505
Flying machine, W. Morgan	843,476
Aerial navigation, H. M. Bellows	844,771
Airship, J. A. Elston	845,539
Aeroplane or craft for aerial navigation, A. & H. Dufaux	846,830
Airship, J. M. Miller	847,965
Air Ship, G. G. Schwabek	848,055
Airship, J. E. Taylor	849,029
Flying apparatus, A. Brandl	849,971
Flying machine, A. P. Bliven	850,616
Airship, J. Shukwech	850,800
Airship, T. S. Baldwin	851,481
Flying machine, M. Nial	851,895
Flying Machine, B. Connolly	852,221
Air ship, H. Faehrmann	853,542
Air ship, G. Bold	853,760
Air ship, E. Baumann	854,555
Air ship, advertising or other, J. C. Burnell	854,461
Aerial vessels, sustaining device for, I. Gruber	855,945
Flying machine, R. Lewitz	856,073
Kite or Flying Machine, Connection Device for the frames of Aerial Vehicles and other Structures, Dr. Alexander Graham Bell and H. P. McNeill	856,838
Flying Machine, F. E. Felts	857,166
Kite, H. Lurz	859,395
Air ship, L. Haines	859,765
Flying machine, W. H. Cook	860,447
Air ship, C. L. Buckwalter	861,017

RARE AERONAUTIC BOOKS FOR SALE

This magazine will publish each month a list of such rare books relating to aeronautics as it is able to secure.

If you desire any of those listed, kindly send check with your order for the amount stated. Should the book ordered be sold previous to the receipt of your order, the money will be promptly returned.

Astra Castra (Hatton Turner). Royal 4to, cloth, gilt top, uncut, London, 1865............$15.00

An Account of the First Aerial Voyage in England (Vincent Lunardi). Portrait of Lunardi by Bartolozzi and plates. Crown 8vo, half calf, uncut, London, 1784. Autograph "V. Lunardi" on fly-leaf......... 15.00

Travels in the Air (James Glaisher). 8vo., cloth, Phila., 1871. 7.50

Crotchets in the Air (John Poole). 12 mo., cloth, London, 1838 .... 5.00

By Land and Sky (John M. Bacon). Four illustrations. 8vo, cloth, uncut, London, 1901 2.50

A Balloon Ascension at Midnight (G. E. Hall). Plates by Gordon Ross. 8vo, boards, uncut. San Francisco, 1902. Limited edition 2.50

Proceedings of the International Conference on Aerial Navigation, Chicago, August 1-4, 1893. Plates, 8vo, cloth, New York, 1894 .... 2.50

Five Weeks in a Balloon (Wm. Lackland). 12 mo., cloth, N. Y., 1869..................... 2.50

Wonderful Balloon Ascents (F. Marion). 12 mo., half leather, N. Y., 1871 .... 2.50

My Airships (Santos-Dumont). Illustrated. Crown 8vo, cloth, uncut, London, 1904......... 2.50

The Dominion of the Air. The story of aerial navigation. Illustrations from photographs. Crown, 8vo, cloth, London, n. d. 2.00

My Life and Balloon Experiences. Photograph of author. Crown, 8vo, cloth. London, 1887 .... 2.00

Travels in Space (G. S. Valentine and F. L. Tomlinson). Introduction by Sir Hiram Maxim, 61 plates. 8vo, cloth, London, 1902. .... 2.00

Balloon Travels (Robert Merry). 12 mo., cloth, N. Y., 1865 ....$ 2.50

Experiments in Aerodynamics (S. P. Langley). Illustrated, 4to, cloth, Washington, 1891.. 2.00

Conquest of the Air (John Alexander). 12 mo., cloth, London, 1902 .... 2.00

The Motor and its Chief Application, Wings, Propulsion in Air, etc. (Com. of Pat., 1849). 8vo., paper 1.50

La Machine Animale (J. Marey). Illustrated, 8vo, cloth, Paris, 1878, French 1.25

Balloons, Airships and Flying Machines (Gertrude Bacon). 12 mo., cloth, N. Y., 1905 .... 1.00

BRITISH AERONAUTICAL INSTITUTE.

An institute has been formed by the Aero Club of the United Kingdom having the following principal objects:

To encourage the study of aeronautics in all its branches; to arrange lectures and demonstrations on all matters connected with aviation; to enable members to compete for prizes arranged for by the Aero Club; to examine and report on proposals for practical aviation; to form a library. The annual dues are 10/6.

FROM AUTOMOBILE TO FLYING MACHINE.

Henry Farman, a prominent English automobile driver, is having an aeroplane built similar to that of M. Delagrange. A 20 H. P. motor supplies the power to a propeller placed forward. The weight of the machine is estimated at 550 pounds, with 323 square feet of lifting surface.

CAPTAIN FERBER BUILDING A NEW MACHINE.

Captain Ferber has recently sold his 40 H. P. aeroplane and, in the middle of May, started work upon a new one, measuring 12 by 12 metres, to be equipped with a 50 H. P. Antoinette motor. The machine is expected to be completed by the first of August.

FOREIGN AERONAUTICAL JOURNALS.

L'AERONAUTIQUE
Official Publication of the Aeronautique Club de France
Subscription, 3 francs. | Quarterly | 58 Rue J. J. Rousseau, Paris.

VOSDOUCHOPLAVATEL
("The Aeronaut")
Subscription, 15 francs. | Ertelew 18, St. Petersburg.

BOLLETTINO DELLA SOCIETA AERONAUTICA ITALIANA
Subscription, 18 francs. | Monthly | 70 Via della Muratte, Rome.

AERONAUTICAL JOURNAL
Official Organ of the Aeronautical Society of Great Britain
Quarterly | 27 Chancery Lane, London, W. C.

THE CAR ILLUSTRATED
A weekly Journal of Travel By Land, Sea and Air
Subscription, 1/16/10 | 168 Picadilly, London, W.

BALLOONING AND AERONAUTICS
Subscription, 18 shillings. | Monthly | 45 Grafton St., Tottenham Ct. Rd , London, W.

LA CONQUETE DE L'AIR
Official Organ of the Aero Club de Belgique
Subscription, 4.50 francs. | Bi-monthly | 214 Rue Royale, Brussels.

L'AERONAUTE
Official Organ of Societe Francais de Navigation Aerienne
Subscription, 8 francs. | Monthly | 19 Rue Blanche, Paris.

AMERICAN MAGAZINE ...OF... AERONAUTICS

SUMMARY

The Scientific American Flying Machine Trophy—That Prize—German Motor Prize—Blue Hill Meteorological Observatory—Aero Club of America—Resistance of Air to Planes—Aeronautical Motors—Ludlow Aeroplane—St. Louis Dirigible and Gasless Machine Prizes—Gordon Bennett International Contest—Chronology—Baldwin Dirigible—Aeronautic Calendar—Notes—Dufour Glider—Correspondence—New Aeronautic Books—Aeronautics in the Current Magazines—Collection on Aeronautics :: :: :: ::

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THE SCIENTIFIC AMERICAN TROPHY FOR FLYING MACHINES OF THE GASLESS TYPE

American Magazine of Aeronautics.

PUBLISHED MONTHLY BY

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ERNEST LARUE JONES, EDITOR AND OWNER

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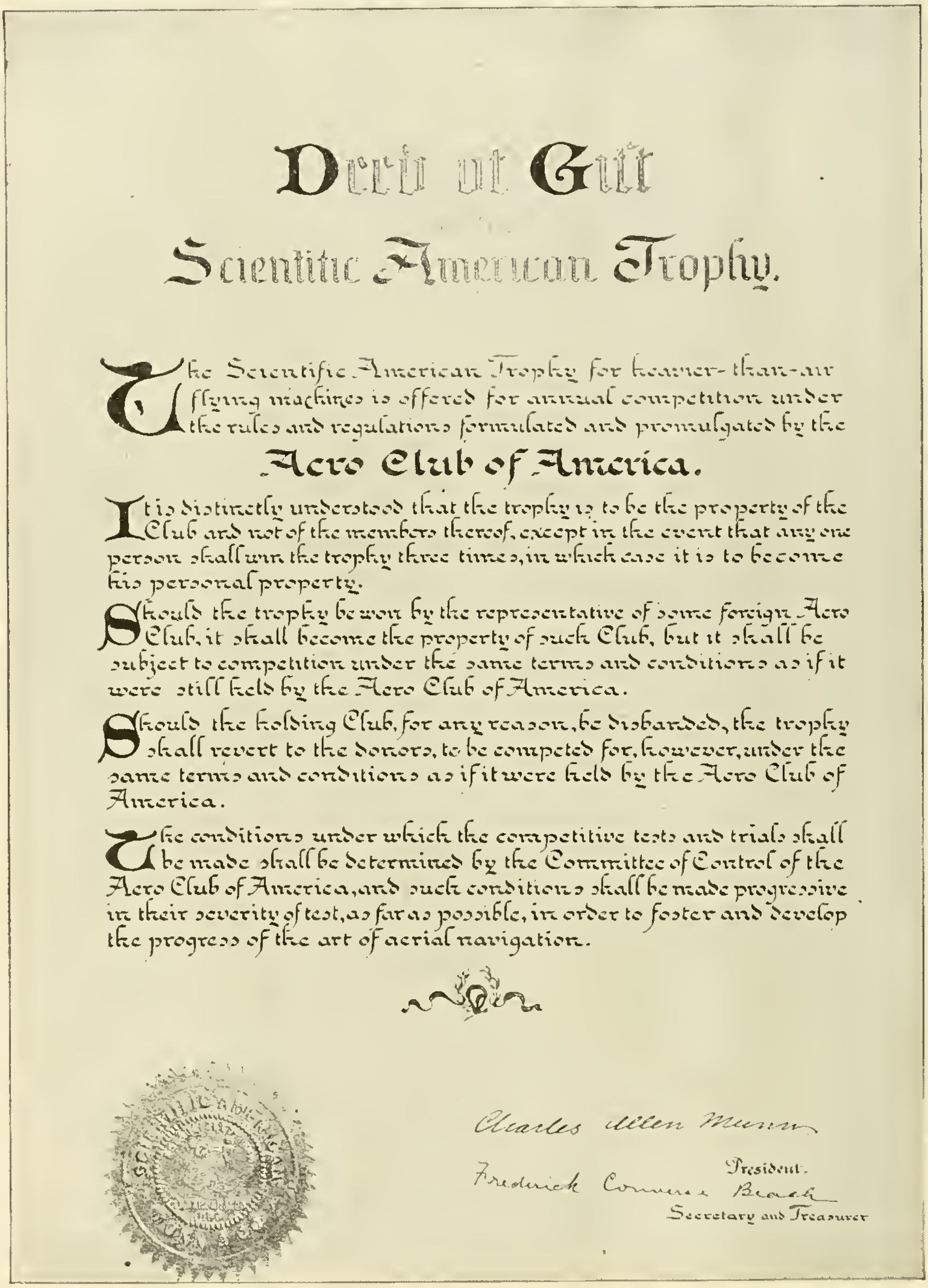
THE SCIENTIFIC AMERICAN TROPHY FOR FLYING MACHINES OF THE GASLESS TYPE.

In presenting to the Aero Club of America the handsome trophy which forms the frontispiece of this issue, the proprietors of the Scientific American have sought to stimulate progress in the science of aerial navigation not only in our own country, but throughout the world. They have endeavored to accomplish this by making the trophy an international one, open to competition annually by anyone who has a heavier-than-air (gasless) machine which shows itself capable of flying under its own power. It is intended to make the conditions of the annual contests progressive in character so that they shall as far as is possible, be always a step in advance of what has been or is being done in the line of aerial navigation by heavier-than-air machines at the time of the various contests. By making the prize more difficult to win, each year, it is thought that a practical flying machine will eventually be evolved. Besides being open to international competition, there is a provision to the effect that the trophy shall become the property of anyone who wins it three times in different years. Thus a special inducement is given to the winner of the first contest to improve his machine, if, necessary, in order to win two of the subsequent contests. That the first one may not be too difficult of accomplishment, yet that it may be somewhat in advance of what has already been publicly done, it was decided to have this competition for a flight of one kilometer (3,280 feet) in a straight line. The first competition will be held at the Jamestown Exposition on the 14th instant, and at least one aeroplane—that of Israel Ludlow—is expected to compete.

This new aeronautical trophy is the handsomest and most valuable one that has ever been offered for an event of this kind. The trophy perpetuates

in silver the Langley model aeroplane, which was the first self-propelled model to fly half a mile, this distance having been covered above the Potomac river in May, 1896. That the machine invented by Prof. Samuel P. Langley was by no means the failure it was painted is evidenced by the fact that Bleriot, in France, has recently made several successful short flights with a machine of this type, fitted with only a 24 H. P. motor, while Santos



Deed of Gift

Scientific American Trophy.

The Scientific American Trophy for heavier-than-air flying machines is offered for annual competition under the rules and regulations formulated and promulgated by the

Aero Club of America.

It is distinctly understood that the trophy is to be the property of the Club and not of the members thereof, except in the event that any one person shall win the trophy three times, in which case it is to become his personal property.

Should the trophy be won by the representative of some foreign Aero Club, it shall become the property of such Club, but it shall be subject to competition under the same terms and conditions as if it were still held by the Aero Club of America.

Should the holding Club, for any reason, be disbanded, the trophy shall revert to the donors, to be competed for, however, under the same terms and conditions as if it were held by the Aero Club of America.

The conditions under which the competitive tests and trials shall be made shall be determined by the Committee of Control of the Aero Club of America, and such conditions shall be made progressive in their severity of test, as far as possible, in order to foster and develop the progress of the art of aerial navigation.

Charles Allen Munn
President.

Frederick Converse Beach
Secretary and Treasurer

Dumont, with his double surface machine, required 50 H. P. and has recently raised this to 100. Because Langley, with his model aeroplane, was the pioneer, it was thought but fitting that his name and his machine should be perpetuated. Hence, in the Scientific American trophy, Langley's model is seen soaring through the clouds, with the sunlight breaking through upon it. The globe represents the firmament, the heavens being shown on the

front and the North American continent on the back. Stars are seen peeping through the clouds and several birds are vieing with the aeroplane in flight. On top of the globe, which is supported on a whirlwind rising from a suitable pedestal, a large American eagle bearing a wreath of victory, has just alighted. On each side of the pedestal base, graceful winged horses spring forth, ridden by male figures bearing aloft olive branches. As can be seen in a measure from the photograph, the trophy is a very beautiful affair. One needs, however, to see this handsome piece of silver itself to appreciate completely its beauty of design and execution. It stands 32 inches high over all and is valued at $2500.00; but its real value is much greater, for it will serve to encourage and stimulate invention and improvement in that most recent and interesting of sciences, the science of aerial navigation.

THAT PRIZE!

In the July number we appealed to our readers for a cash prize in competitions of "gasless" machines. We asked for a considerable amount, we know, but we indulged, perhaps unfortunately, in a belief that there might be enough wealthy sportsmen who would appreciate the aid that such a prize would lend.

In making the amount as large as we did we thought that this great United States would be able to devote

$25,000

to such a purpose when little countries like France and England can each offer prizes of $50,000. Though personal applications have been made to many to subscribe toward such a prize we have thus far met with failure.

To repeat—the proposition briefly is somewhat as follows: There are hundreds of inventors of aerial apparatus, good, bad or indifferent. Among them all there may be something of value. The majority are devoting their earnings and their spare time to experiments on a small scale. After reaching a certain point they can go no further for lack of funds. They cannot obtain funds from capitalists for the reason that no one is willing to expend money until he sees a good chance of getting it back—with interest. Now, then, we have the inventor, the idea, the capitalist. We want to get them together. If the capitalist sees that by expending a few hundreds on further experiments he may gain a few thousand he is willing to take a chance. If we have the prize hung up we have the incentive. An inventor with a possible machine can say, "Mr. Capitalist, there is that prize. I think I can win it. Will you risk, say, $500 or $1,000?" The capitalist then has something to figure on. But until we get this prize the inventor cannot reach the capitalist.

$5,000

We have in mind a man who believes he has something practical. That belief is nothing new. But we believe he has something at least worth a trial. The machine, moreover, it is claimed, is complete and awaiting final flight. The inventor desires, in case he makes a successful flight, to be reimbursed, at least, for his expenditures. He asks that a prize of but $5,000 be offered contingent upon his flying 1,000 feet. Such a flight would be the record

public flight to date by a "gasless" machine. This attempt is desired at the earliest moment.

We mention this instance as a case in point. No one is prepared to say whether this or that machine may not be developed into something practical. If the prize is not won the donor, or donors, will not be losers. If the prize is won, they will still be gainers by the knowledge that they have made possible an actual demonstration of the practicability of dynamic flight.

Are there not in this broad land of ours some men whose purses are likely to leak along philanthropic paths?

GERMAN $5,000 MOTOR PRIZE.

A German aeronautic society has offered prizes to this amount to induce German inventors to work on light motors. The prizes are restricted to German manufacturers and the motors must be of 20 h.p. Major Gross, Prof. Klingenberg and Major von Parseval are members of the committee.

THE CLUB.

Out of three hundred members there are a bare dozen who have made actual balloon flights. The rest have been deterred—by what reason? Among other objects the Club was formed to promote the sport of ballooning, but the members have failed in the majority to take advantage of the opportunities offered.

In order to provide a greater inducement, a movement is on foot to purchase new envelopes for the Centaur and Orient and have as many members as possible make trips. It is planned to appoint pilots who will offer their services without charge, and to furnish the balloon and gas at a flat rate of, say, $20, to any member making his first ascent, the Club paying the balance of the cost of gas and miscellaneous items. Thus a member having never before made an ascent can do so at a sole outlay of $20, in addition to his railroad fare. The balloons will be stationed at some advantageous point, probably Pittsfield, and returned there after each ascent. Applications to be received and accepted in the order of receipt. In case the member fails to use the balloon on the date assigned he forfeits the $20 deposited with the application. Alan R. Hawley is the promoter of the scheme and it is one to which every member should lend his aid. To provide the necessary sum to enable the Club to do this it is suggested that members be assessed $5 each. Mr. Hawley feels that he has done his share towards the promotion of this most delightful of all sports and is anxious to see some competitors for long distance honors.

Philadelphia also might be a suitable location for a permanent aerodrome. There is good gas to be obtained there and the situation of that city is excellent. It is no nearer the sea than many ballooning centers abroad and one can run down in two hours from New York after telephoning to have the balloon ready upon his arrival. There is no time lost in going a great way from New York and, perhaps, after arriving, having to wait for a breeze. We attend to our daily business right along and on finding a good breeze after breakfast, telephone, answer the morning's mail, take the train and we are off the ground shortly after our lunch in Philadelphia.

ATMOSPHERIC EXPLORATIONS CONDUCTED BY THE BLUE HILL METEOROLOGICAL OBSERVATORY.

At the Milan meeting of the International Commission for Scientific Aeronautics it was decided to concentrate the work of exploring the air this year upon four grand series of ascensions, in addition to the usual monthly ascensions. The former last several days and observations are to be obtained not only by balloons and kites but also by special observations of cloud drift and upon mountain summits. The first of these quarterly ascensions was appointed for the week commencing July 22d, and, as has been the case for several years, co-operative kite-flights and cloud observations were made at Blue Hill Observatory. It is supposed that the United States Weather Bureau Station on Mount Weather, Virginia, which has recently taken up the work of exploring the free atmosphere, also participated in this series of ascensions. Unfortunately, light winds prevailed on Blue Hill during almost the entire week, so that but four kite-flights were possible and only on the 27th was the height of a mile and a half attained. During an evening flight, the top kite and the meteorograph broke away, and the latter has not yet been recovered. Had a small steamer been equipped for kite-flying in Massachusetts Bay, as was done for the first time by Professor Rotch in 1901, the kites would have been rendered independent of the wind by the motion of the vessel either in the direction of the wind or against it, for, in order to lift the kites, a velocity of at least 14 miles per hour is required, which is more than the average velocity of the wind in Summer on Blue Hill. Kite-flying was continued during the following week in more favorable conditions and of the three flights, the highest on August 2d reached an altitude of nearly two miles.

Although no efforts were made in America to secure observations over the ocean, as was done abroad, Professor Rotch, the Director of Blue Hill Observatory, and a member of the International Commission, extended his field of work by sending Mr. Clayton to the White Mountains to obtain observations in the free air at the height of Mount Washington and on that mountain itself. Such an investigation had already been conducted privately by Mr. Ferguson of the Blue Hill Observatory, who had installed self-recording instruments on the summit of Mount Washington and at Twin Mountain Stations for the purpose of comparing the conditions on the mountain with those shown by instruments lifted by kites to the same height. Between July 21st and 28th Mr. Clayton obtained three such series of observations with kites at a height exceeding that of Mount Washington (6300 feet), and on the days when the wind was too light to lift the kites, he carried the instruments up the mountain. The records seem to indicate a greater wind velocity on top of the mountain, and probably a lower temperature, than in the free air.

Professor Rotch intends to resume the work of exploring the air at great heights by sending up more sounding balloons from Saint Louis next October, the successful experiments already conducted there being described in the first issue of this magazine. The situation of Blue Hill on the Atlantic coast precludes the use of balloons, but Saint Louis has proved an excellent place for this work. It is intended to make the ascensions during the first half of October so as to include the third, which is the date fixed for the international observations.

A LETTER TO AERONAUTS.

The American Magazine of Aeronautics is very desirous of obtaining accurate and complete records of all balloon and airship flights made in America during each month.

We would appreciate it very much if you would send us such records at the end of every month and we would be very glad to supply you with the blank forms for the purpose upon request.

May we not expect to hear from you?

AERO CLUB OF AMERICA.

To Members:

Will you not kindly send the Club accurate records of all ascensions made in order that our file may be complete? The number of our delegates to the International Congress is directly dependent upon the number of trips made. As a matter of Club interest every one is urgently requested to promptly report their voyages, and as detailed as possible. Blanks will be supplied to those who have not already received same. AUGUSTUS POST,

Secretary.

August Ascensions.

Aug. 1.—A. L. Stevens and William F. Whitehouse in the "Stevens No. 20," 623 cu. metres, at Pittsfield, Mass. Ascent at 12.08 p. m., descent at 12.33 p. m. Gas very poor and no ballast or instruments could be carried. Mr. Whitehouse's first ascent. Initial flight of new balloon.

Aug. 7.—A. L. Stevens in the "Stevens No. 20," at Pittsfield. Ascent at 1.15 p. m., descent at East Windsor 3.01 p. m. Gas very poor. Distance 19 miles.

Aug. 29.—A. L. Stevens and William F. Whitehouse in the "Stevens No. 21," 1000 cu. metres, at North Adams. Ascent at 2.50 p. m., descent at Somersville, Conn., 6.55 p. m. Distance 50 miles. Initial flight of new balloon.

Aug. 29.—Alan R. Hawley in the "Stevens No. 20," 623 cu. metres, at North Adams. Ascent at 2.43 p. m., descent at Indian Orchard 6 p. m. Distance 43 miles. All ballast used.

ON THE RESISTANCE OF AIR TO THE MOTION OF PLANE SURFACES

By Otto G. Luyties.

As our atmosphere is so light a medium it is apparent that aerial navigation will ultimately be accomplished successfully by utilizing its inertia rather than its buoyancy.

Reaction devices of many kinds have been suggested, including aeroplanes, orthogonal flyers, flapping machines, helicopters and so forth. Even dirigible balloons are reaction devices in so far as they depend upon the inertia of air for the resistance to their propellers, while they are themselves retarded by the inertia of opposing air currents.

For these reasons I hope that the following discussion of the pressure of a frictionless elastic fluid upon a relatively moving plane will be of especial interest to aeronauts.

If a plane surface be moved normally relatively to a fluid such as air the impinging particles will offer a certain resistance. The power required to overcome this resistance will be the pressure times the velocity

and will be equal to the change in the energy of the air particles or half their mass times the square of their velocity. We may write this

$$P\ v = \tfrac{1}{2}\ m\ v^2$$

The mass of the air will evidently be the weight of the air per unit of volume divided by g and multiplied by the area and the velocity so that

$$P\ v = \tfrac{1}{2}\left(\frac{w}{g} A\ v\right) v^2 = \frac{w}{2g} A\ v^3$$

Hence

$$P = \frac{w}{2g} A\ v^2$$

In the above deduction we assume that the entire kinetic energy of the air particles is employed in resisting the advance of the plane. We furthermore assume that the particles exert no other effective pressure on the plane.

It is, however, conceivable that certain particles would rebound with an energy equal to that of their impact. Such particles would exert a double pressure due to reaction as well as impact. Every particle rebounding in this manner, however, will collide with one still approaching the plane and either counterbalance its energy, or deflect it from its path. Therefore, under the assumption of a double pressure due to reaction as well as impact, the number of striking particles will be reduced by one-half, so that the total pressure on the plane will be the same under either assumption.

The peculiar action of rebounding particles colliding with others still approaching we may refer to as interference. This action will be most pronounced in the case of normal planes and will be negligible in the case of sharply inclined planes, the rebounding particles falling in with the prevailing stream lines. This is an important consideration in deducing the pressure on inclined planes.

Suppose that a plane makes an angle a with the line of its progress. It will then be foreshortened in proportion to the sine of this angle, the number of particles whose path is blocked being reduced in such proportion.

The energy of the impinging particles will accordingly be

$$E_i = \frac{w}{2g} A \sin a\ v^3$$

But the particles will rebound from the plane with an equal energy

$$E_r = \frac{w}{2g} A \sin a\ v^3$$

making an angle a with the plane on the other side of the normal.

The power acting on the plane will therefore be the resultant of these two; namely,

$$E_n = \left(\frac{w}{2g} A \sin a\ v^3\right) 2 \sin a$$

The direction of action of this resultant power will be normal to the plane as the components are equal and symmetrically disposed. Therefore, the pressure on the plane will be normal, a peculiar fact which has long been known from experiment.

To find the pressure on the plane we observe that the normal pressure times the normal motion equals the normal resultant of the energy.

$$P_1\ V_n = E_n$$

In this case, however, Vn is much less than the velocity of the particles

as an inclined plane progresses normally only in proportion to the sine of the angle.

Therefore

$$V_n = v \sin a$$

and

$$P_1 V_n = P_1 v \sin a = \left(\frac{w}{2g} A \sin a\, v^3\right) 2 \sin a$$

whence

$$P_1 = \left(\frac{w}{2g} A\, v^2\right) 2 \sin a = P \times 2 \sin a$$

The pressure of a frictionless elastic fluid on a relatively moving sharply inclined plane is accordingly equal to the pressure on an equal normal plane moving at the same speed multiplied by twice the sine of the angle of inclination.

The pressure on an inclined plane is, however, affected by interference, such interference increasing with the square of the angle.

As we have already shown this interference in the case of a normal plane will be equal to half the total pressure we might otherwise expect. It will therefore be numerically equal to $\sin^2 a$ when the full normal pressure is expressed by $2 \sin a$.

The normal pressure on an inclined plane is accordingly

$$P_1 = \frac{w}{2g} A\, v^2 \left(2 \sin a - \sin^2 a\right)$$

This is a general formula for plane surfaces which will be found to agree reasonably well with experiment at any angle.

Substituting the value of the pressure on a normal plane we find

$$P_1 = P \left(2 \sin a - \sin^2 a\right)$$

The accompanying table gives the normal pressures for various angles as computed by the new formula compared with Langley's experimental results and with the formulae and figures of several other investigators.

It is apparent that the new formula agrees most closely with Langley's and Thibault's figures and that it is of comparatively simple form.

On further consideration it becomes apparent that the interference is very small for small angles so that $\sin^2 a$ is negligible for planes of very acute inclination.

For these we may write

$$P = 2 P \sin a$$

For small angles, furthermore, $2 \sin a$ is essentially equal to $2 a \sin 1°$. The sine of one degree is approximately one sixtieth, so that we obtain

$$P_1 = \left(2 P a \times \frac{1}{60}\right) = P \frac{a}{30}$$

This formula should be very convenient and is correct within 10% for angles up to 15°, which is well within the limits of our accuracy at present.

The pressure on a 5° plane for instance will be $\frac{5}{30} = \frac{1}{6}$ and on a 10° plane will be $\frac{10}{30} = 1/3$ of the pressure on a normal plane.

It appears incidentally that the question of interference brought up in this article should be further analyzed, as it undoubtedly has an important

bearing on the well known shifting of the centre of pressure with changes in the angle. The amount of interference probably differs for various curvatures of the surface and for different outlines and various ratios of height to breadth.

The purpose of this article, however, has been to discuss the question of the pressure of an elastic frictionless fluid on a relatively moving plane and to derive a general formula, which we have found to be

$$P_1 = \frac{W}{2g} A V^2 \left(2 \sin a - \sin^2 a\right)$$

From which we obtain the ratio

$$P_1 = P\left(2 \sin a - \sin^2 a\right)$$

And for small angles

$$P_1 = P \frac{a}{30}$$

P_1 IN TERMS OF P

	Angle a	1°	5°	10°	15°	20°	30°	45°	60°	90°
Langley	Resultant Recorder	......	.150	.300	.460	.600	.780	.930	....	1.000
Langley	Component Recorder	......	.160	.300	.440	.570	.780	.910	....	1.000
Luyties	$2 \sin a - \sin^2 a$	.035	.166	.318	.451	.567	.750	.914	.982	1.000
Duchemin	$\frac{2 \sin a}{1 + \sin^2 a}$	.035	.174	.337	.486	.612	.800	.945	.990	1.000
De Louvrié	$\frac{2 \sin a\ (1 + \cos a)}{1 + \cos a + \sin a}$	.035	.167	.319	.457	.581	.789	1.000	1.098	1.000
Thibault	....	.....	......	.328	.420	......	.764	....	....	1.000
Rayleigh	$\frac{(4 + \pi) \sin a}{4 + \pi \sin a}$	......	.146	.273	.384	......	.641	....	....	1.000
Hastings	$2 \sin a$ *	.035	.174	.347	.518	*	......	....	....	....
Luyties	$\frac{a}{30}$ *	.033	.167	.333	.500	*	......	....	....	....
von Loessl	$\sin a$	.017	.087	.174	.259	.342	.500	.707	.866	1.000
Hutton	....	......	......	.264	.351	......	.750	....	....	1.000
Weissbach	$\sin^2 a$	.000	.008	.030	.067	.117	.250	.500	.750	1.000

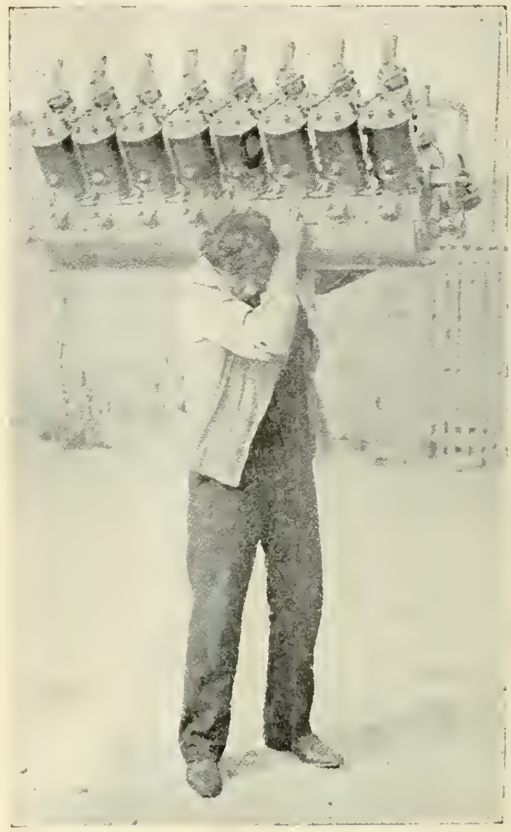
* Intended for small angles only.

AERONAUTICAL MOTORS.

It is intended to publish in each number a description of the various light motors now on the market which are adapted for use in dirigible balloons and heavier-than-air machines.

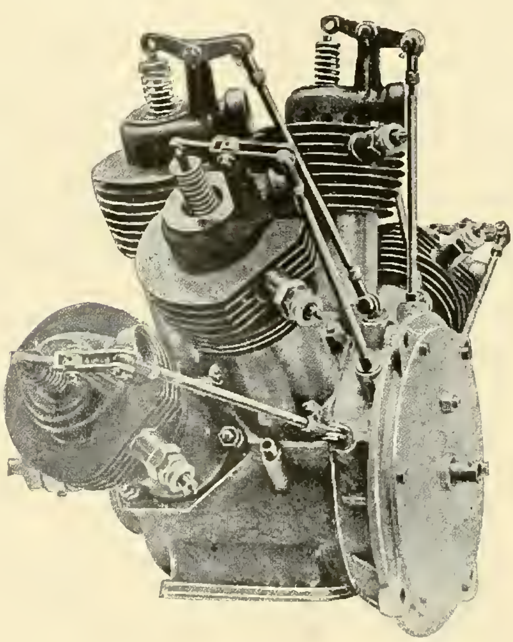
The lightest motor in the world is now made by the Antoinette people. The 100-hp., 16-cylinder motor to be used in the new Santos-Dumont aeroplane weighs complete but 130 kg. (286 lbs.) This motor develops, brake test, 123 hp., which brings the weight per horse-power down to 1.05 kg. (2.3 lbs.)

Almost as light is the Pelterie aviatic motor of 35 hp., weighing slightly less than 100 lbs., or, per horse-power, 2.8 lbs. *The Automobile* has this to say about it:



ANTOINETTE.

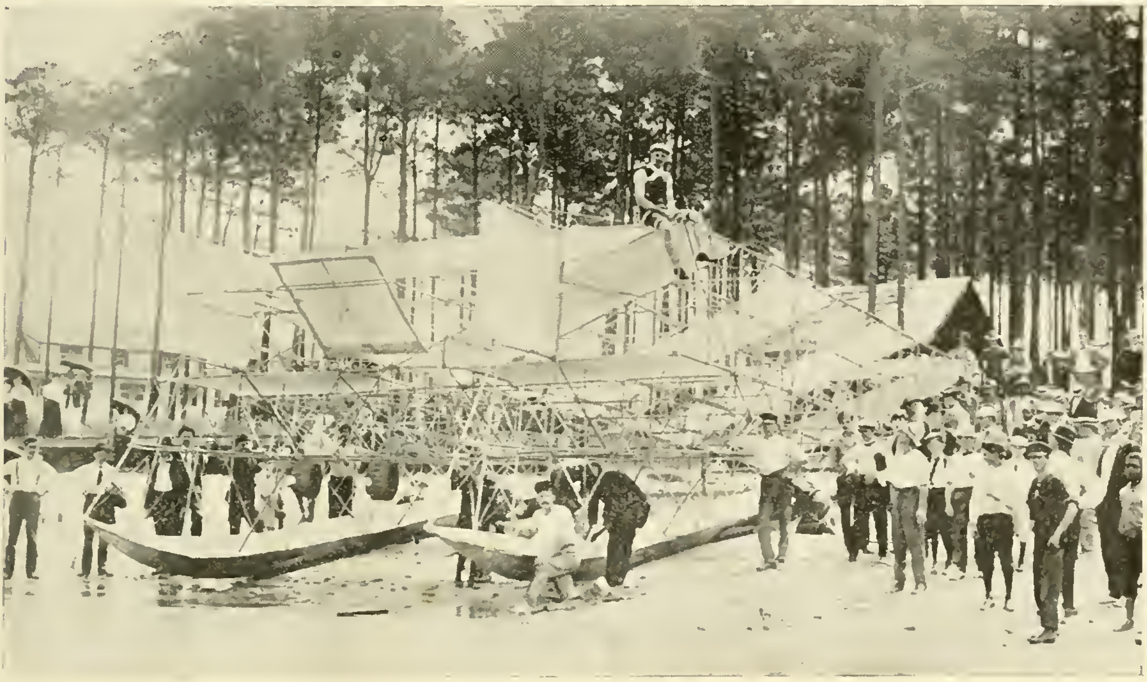
"Its arrangement is unique in that the six cylinders composing it are mounted on a crankcase barely long enough to accommodate two of their size were they placed in the ordinary manner. This also greatly simplifies the engine by making possible the employment of a two-throw crankshaft, each group of three cylinders acting upon a common crankpin. Air-cooling is employed, of course, and the cylinders, which are set at an angle of approximately 90 degrees to one another, are also staggered so that each one gets the full benefit of a direct cooling current. Considerable ingenuity has, of necessity, been exercised in the arrangement of the valve-operating mechanism, the three push rods for the front group of cylinders being of the usual type employed in connection with rocker arms, while the other three are jointed and operate at an angle as shown, the inlet valves being of the automatic type. No details of the dimensions of the motor or of its speed are given, though the latter as well as the compression must naturally be high in order to produce its rating of 35 horse-power. It is of considerable interest as demonstrating to what lengths light weight and compactness may be carried where the internal combustion principle is applied to the design of a motor for aeronautical purposes.



PELTERIE.

A STORY WITHOUT WORDS.

The trial of the new Ludlow aeroplane in Hampton Roads, off the Jamestown Exposition, during the month of August.

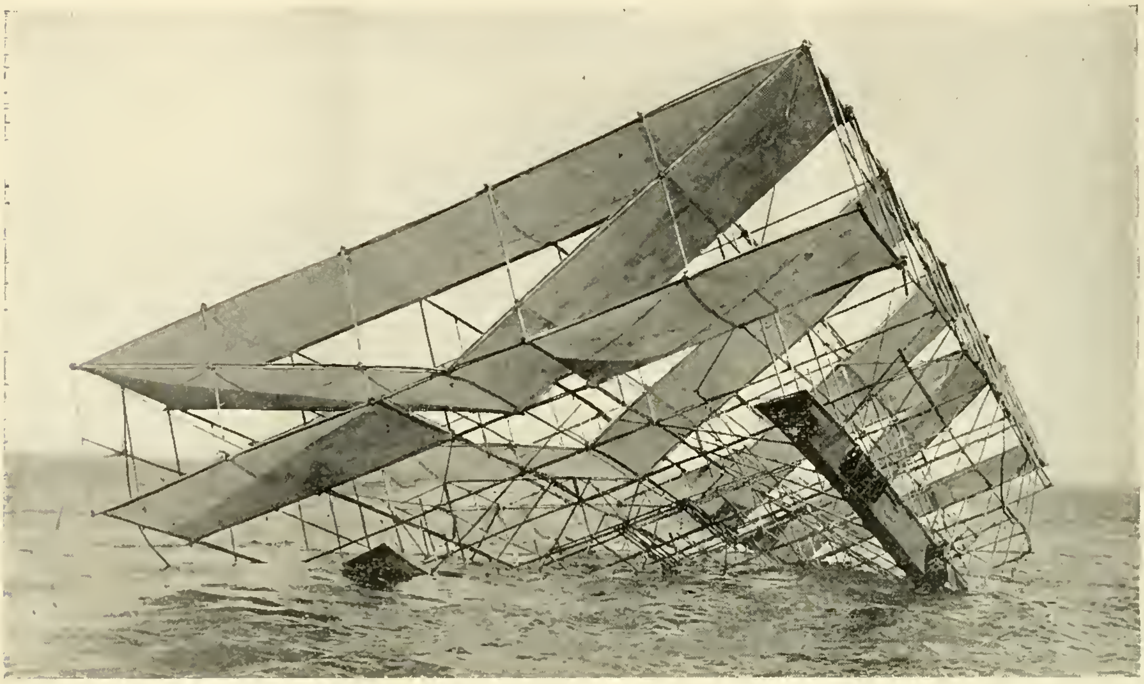


Copyright by the Jamestown Official Photograph Co.

THE AEROPLANE MOUNTED ON PONTOON BOATS ABOUT TO BE LAUNCHED. CAPTAIN T. T. LOVELACE IN HIS BATHING SUIT READY FOR THE RIDE.

Copyright by the Jamestown Official Photograph Co.

TOWED BY THE U. S. NAVAL TUG POTOMAC ACROSS HAMPTON ROADS; THE AEROPLANE PASSES IN FRONT OF THE BATTLESHIPS AT ANCHOR.



THE AEROPLANE'S NOSE GOES DOWN INTO THE WATER, THE REAR RISES UPWARD AND THE EXPERIMENT COMES TO AN UNTIMELY END DUE TO THE WATERLOGGING OF THE PONTOONS.

THE LOST ORATOR.

(Tune of the Lost Chord)

Seated one day in my airship,
I was weary and ill at ease,
As my gas-bag drifted idly
Over the waving trees;
I knew not what I was doing,
But I heaved a sand-bag then,
And it struck on a farmer's shoulders
And he cussed nothing like amen.

His oaths came through the twilight
And punctured the evening's calm;
At handling deck-hand language
This Reuben could take the palm;
His words told of pain and sorrow
And desire to take my life;
All because of that innocent sand-bag
He was bent upon bloody strife.

I have tried, but I try all vainly,
To arouse those sounds divine,
But I always dump my sand-bags
On some milder fellow's spine;
It may be some other balloonist
Will hear that talk again,
And will write it on fireproof paper,
With a patent asbestos pen.

—Denver Republican.

DIRIGIBLE BALLOON AND HEAVIER-THAN-AIR MACHINE CONTESTS AT ST. LOUIS.

It is expected to hold competitions for dirigible balloons and gasless machines on October 22, at St. Louis. The *Scientific American trophy is available for competition, as well as the cash prizes offered by the St. Louis Club. These competitions will be conducted under the auspices of the Aero Club of St. Louis, which has appropriated the sum of $5,000.00 for aeronautical competitions and exhibitions, to be participated in by dirigible balloons and by aeroplanes, or any heavier-than-air vehicles for navigating the air, which are absolutely free in their flight, after their start has been made, and which require no permanent or visible connection with the earth.

The subjoined rules have been adopted to govern the competitions, the Aero Club of St. Louis reserving the right, however, to amend or alter the same at any time prior to a formal entry being filed, or subsequently. In the latter event, persons who have entered shall have the right to withdraw if they do not consent to the amended rules and their entrance money shall be refunded. The club also reserves the right to promulgate, as occasion may require, minor rules or regulations not inconsistent with the general rules.

General Rules and Regulations.

I.

Entries.

(a) The competitions will be open to all forms of vehicles without limitations as to the power employed or the mechanical principles involved, except as hereinafter specified.

(b) All vehicles admitted to the contests must be absolutely free in flight after the start has been made. No vehicle requiring any permanent or visible connection with the earth will be admitted.

(c) No vehicle can start unless satisfactory to the committee.

(d) All entries will close October 1st. If requested, entries will be considered as confidential until that date.

(e) As an evidence of good faith, an entrance fee of $10.00 will be required, which will be refunded when the contestant occupies the space assigned him with an apparatus conforming to the rules.

(f) Each vehicle shall carry at least one person in its flight.

II.

Competitions.

The sum of $5,000.00, appropriated for prizes, will be divided into offerings for competitions in two classes, as follows:

Class A—Competition for dirigible balloons, open only to that particular form of vehicle.

Class B—Competition for aeroplanes and other heavier-than-air vehicles of any form which have no gas bag attachment.

III.

Prizes.

Class A—The sum of $2,000.00 will be given the competitor who, in strict accordance with the rules, shall make the round of the course with a dirigible balloon in the best average time, and the sum of $500.00 will be given to the competitor who, in strict accordance with the rules, shall make the round of

*Rules of competition for this trophy were printed in the August number.

the course with a dirigible balloon in the next best average time. No prize shall be awarded any vehicle in this class which does not cover the full course at least once in continuous flight without touching the ground.

Class B—The sum of $2,000.00 will be given the competitor who, in strict accordance with the rules, shall make the longest or best continuous flight with an aeroplane or any heavier-than-air vehicle admissible under the rules, and the sum of $500.00 will be given the competitor who, in strict accordance with the rules, shall make the next longest or best continuous flight with an aeroplane or any heavier-than-air vehicle admissible under the rules. The committee in making its decision has the right to consider the average height, distance, time and general behavior of the vehicle, together with its merits for practical use. No prize shall be awarded any vehicle in this class which does not make a continuous flight, without touching the ground, of at least 100 feet.

IV.
Conditions.

(a) In no event will more than one award be made to any one vehicle.

(b) If it shall appear at the close of the trials that two or more competitors have equal records, the Aero Club of St. Louis reserves the right to prescribe a further trial or trials under the same rules and regulations governing the preceding contests.

V.
Course.

(a) The prescribed course will begin and end in or adjacent to the enclosure of the Aero Club of St. Louis.

(b) The course will be triangular in shape and will have a total length of about three-quarters of a mile, the start and finish being made from the home goal. The course will be marked by captive balloons or in such other way as the Aero Club of St. Louis may deem best adapted to define the goals.

(c) Each competitor will be permitted to choose the direction in which to start, but he shall start from the home goal, turn around each of the outer goals, and return to the starting point.

(d) The time occupied in a trial will be measured from the moment the vehicle, entirely free from the ground, passes across the line at the starting goal to the moment of passing over the home goal.

VI.
Contests—How Conducted.

(a) The trials shall take place on or about October 22nd, the exact date to be fixed later by the Aero Club of St. Louis, who shall also have the privilege of extending the time for the tests from day to day, as deemed necessary or advisable.

(b) The average speed of the machines shall be computed for the actual air-line distance over the ground, making no allowance for the wind or the deviations from straight lines to or from the established goals.

(c) The judges may, in their discretion, permit a contestant to go over the course more than once in continuous flight, and in such event the average time of such trials shall be considered the time made by such contestant.

(d) If any mishap or accident should occur to a contestant or his vehicle after the start is made, the judges, in their discretion, may permit another trial.

(e) The time for the trials shall be set by the committees in charge of the competitions.

(f) The conduct of the contest will be in charge of a committee or committees to be appointed for that purpose by the Aero Club of St. Louis.

(g) The Aero Club of St. Louis will provide a suitable enclosure for the aeronautic grounds and defray all necessary expenses connected therewith, but each competitor must provide any special structure or apparatus required by his entry at his own expense.

GORDON BENNETT INTERNATIONAL RACE.

St. Louis, October 21, 1907.

Arrangements.

The postponement of the James Gordon Bennett International Aeronautic Cup Contest to be held at St. Louis was made necessary by the inability of the Laclede Gas Light Company of St. Louis to supply the proper quality of gas on the date originally set. The race was to have been held on Saturday, October 19th, while the date now fixed is Monday, October 21st. The gas for the balloons is to be supplied from a large holder on Chouteau and Newstead avenues—a few blocks removed from the ascension grounds in the east end of Forest Park.

This holder supplies a large section of the City of St. Louis with its gas. Ordinarily the gas stored in it is a mixture in which water gas predominates. As water gas has much less ascensional power than coal gas it was necessary to make arrangements for providing coal gas for the race. The Laclede Gas Light Company held that in any ordinary week day the demand on them for gas is so great that they could not possibly put the Chouteau holder out of commission for two or three days.

It is necessary to empty this holder of all the ordinary illuminating gas it contains and then to re-fill it with coal gas made with a special reference to its lifting power. Saturday afternoon and Sunday are the only days, the company held, when it could make this change.

Now that consent has been obtained for changing the date of the race from Saturday to Monday, it is the plan of the gas light people to commence emptying the holder on Saturday afternoon of its regular illuminating gas and as soon as it is thoroughly free of the water gas mixture, to re-fill it with the special quality of coal gas that is to be made for this aeronautic race. The holder will be filled to its capacity Sunday and on Monday the balloons will be supplied from it. In this manner the holder will only be out of commission for general use one busy day—Monday—as Saturday afternoon and Sunday are holidays.

It is the intention of the Gas Light Company to commence the manufacture of special coal gas of high lifting power a month or so before the race takes place. All of the Company's coal gas will be made of that particular quality during this period, so that everything will be in perfect working shape when the time for the race comes round. In this way, the company expects to give the contestants a quality of gas of considerably more lifting power than is usually supplied them. The greatest pains will be taken to produce the most perfect gas for balloon purposes that it is possible to make from coal.

The Aero Club of France has named Maurice Mallet as their member of the Contest Committee.

Entries.

The line-up to date, as received by cable and unconfirmed, is as follows—11 balloons:—

France......Aero Club of France, 2 balloons. Pilots, Alfred LeBlanc and Rene Gasnier. Aides, M. Mix and Chas. Levee.

England.....Aero Club of the United Kingdom, 3 balloons. Pilots and aides, Hon.. C. S. Rolls, Griffith Brewer, Prof. A. K. Huntington, J. T. C. Moore-Brabazon, Lord Royston and Mr. Moore-Brabazon.

Germany....Deutscher Luftschiffer-Verband, 3 balloons, namely, "Dusseldorf," "Pommern" and "Schwaben." Pilots and aides, respectively, Hauptmann von Abercron and H. Hiedemann, Oscar Erbsloh, Herr Meckel.

America.....Aero Club of America, 3 balloons. Pilots, Lieut. Frank P. Lahm (alternate Major Henry E. Hersey) in the "United States," Alan R. Hawley in the "St Louis" and J. C. McCoy in the "America."

Hon. C. S. Rolls, Griffith Brewer, Prof. Huntington, Hauptmann von Abercron, Oscar Erbsloh, Lieutenant Lahm and Major Hersey were contestants in last year's Gordon Bennett.

The entries of Spain and Italy have been thrown out by the Federation Aeronautique Internationale on technicalities.

CHRONOLOGY.

Aug. 6. Bleriot makes two consecutive flights of 122 metres (400 feet) and 143 metres (469 feet), each without coming to rest. The aeroplane landed on the ground between the jumps, but continued flight after running about 12 metres (39 feet). On landing after the second flight the propeller blade and shaft were broken. Equilibrium is maintained by the movements of the operator.

Aug. 9. Elmer Van Vranken, of Gloversville, N. Y., makes a flight lasting 40 minutes in a dirigible built by the Steele Manufacturing Co. After executing various manoeuvres the return trip was begun against a strong head wind. A short distance from the point of start some one seized the drag rope, and, despite protests, pulled the ship to the ground. In all, five miles were covered.

Aug. 10. The French military balloon "Patrie" makes a flight from Paris to the country seat of the President of France at Rambouillet, fifty kilometres (31 miles). Making a landing on the lawn, the four officers pay an hour's visit and start off again at a speed of 60 kilometres (37 miles) an hour.

Aug. 14. The Hague Conference forbids the throwing of explosives from balloons and airships in war, it is reported.

Aug. 18. Capt. Thos. S. Baldwin makes first public flight with his new twin screw dirigible.

Aug. 23.—Carl E. Myers makes initial flight in his new collapsible dirigible "No. 23" at Saginaw, Mich. An 18-mile wind drove the ship a distance of six miles from the start. On the wind lessening, the return was successfully made under power.

Aug. 24. The "Ben Franklin," the largest balloon in this country, makes its initial flight at Philadelphia. It has a capacity of 2,600 cubic metres (92,000 cu. ft.) of gas, accommodates twelve persons and carries 150 bags of ballast. Six persons ascend and travel a distance of 160 miles.

Aug. 27. The German military dirigible and the Parseval ship make simultaneous trips, the various manoeuvres lasting several hours. It is claimed that the flights of this day excelled the past work of the French Patrie.

THE NEW BALDWIN DIRIGIBLE.

Captain Thomas S. Baldwin's new airship is a radical departure from old methods in at least one particular. The principal feature is the double propellers, placed one behind the other. Captain Baldwin claims actual increased efficiency in addition to, in this way, doing away with the torque. The following illustration shows the two propellers.

BALDWIN'S AIRSHIP.

The engine is of the vertical type, four cylinders, air cooled, weighing 100 pounds, with a rated horse-power of fifteen. Mr. G. H. Curtiss, the builder of the motor, states: "It is evident that when these large engines are used some arrangement must be made to do away with the torque. In some of our experiments we have had frames turn up in a horizontal position from the resistance of propellers whirling in opposite direction. In addition to this advantage, the twin propellers have a stronger pull than the single propeller. As you will note from the photo, they are placed one in front of the other, and are operated by a shaft within a shaft instead of reverse gears to reverse motion of the rear propeller and turn it at the same speed in opposite direction. It appears to us that with the high speed engines this construction will be absolutely necessary on any dirigible balloon."

The first flights at Hammondsport were most successful. In the illustration shown below, Mr. Curtiss is the operator. The first public flight was made by Captain Baldwin at Schuetzen Park on Sunday, August 18, in consid-

G. H. Curtiss in the Baldwin Ship.

erable wind, during which flight, though short, he executed several manoeuvers and found his ship at all times under perfect control. The landing was made within a few feet of the starting point.

AERONAUTIC CALENDAR.

Sep. 11. Conference of the eleven clubs comprising the Deutscher Luftschiffer-Verband, at Düsseldorf.

Sep. 12. Annual Conference of International Aeronautic Federation at Brussels.

Sept. 14. Competition of gasless machines at Jamestown Exposition for the Scientific American Trophy.

Sep. 15. International Race at Brussels.

Sep. 29. Grand Prix at the Tuileries, Paris.

Oct. 21. Gordon-Bennett International Race at St. Louis.

Oct. 22. Competitions for Cash Prizes offered by Aero Club of St. Louis and for the Scientific American Trophy.

Oct. 28. Aeronautic Congress at Jamestown Exposition.

Nov. 15. International Exposition of Aeronautic Photographs, at Paris.

NOTES.

Twenty balloons are entered for the French club's Grand Prix Sept. 29.

Lieut. Lahm has written for Outing Magazine for October an article on "Ballooning and Aerial Navigation."

Cortlandt Field Bishop, President of the Aero Club of America, will sail for America on October 2, on the Kronprinzessin Cecilie.

Both Strobel and Baldwin have announced their intention of competing for the St. Louis Club's dirigible prize.

Cortlandt Field Bishop expects to bring over with him a new balloon for his own use.

According to "Le Matin," the French government is asking for funds to build three more airships of the "Patrie" type.

Count von Zeppelin is rushing work on his new airship in order to complete it before the International Congress at Brussels September 12-15.

Major B. Baden-Powell's "Ballooning as a Sport" should be read by every one at all interested in ballooning or intending to take up the sport.

Col. Max C. and Mrs. Fleischmann and Mr. Stevens made an ascension from North Adams on September 5th.

Lincoln Beachey during the month of August, at Jamestown Exposition, made 11 successful flights in his dirigible. The U. S. Government has detailed 10 soldiers for duty at the Aeronautic Building.

Col. Max C. Fleischmann, of Cincinnati, has written for the September Cosmopolitan an account of his experiences hunting in Africa and the Far North. Now for ballooning!

While the balloon of Russell E. Gardner, member of Aero Club of St. Louis, was being inflated on August 30, a team attached to a tallyho became frightened and ran into it. The balloon is a total loss.

On August 31 a cable was received to the effect that England's dirigible which has been building at Aldershot for the last two years, is about to be completed. It is said to approximate the type of La Patrie.

From the latest reports it looks as though Wellman will have to delay his polar trip another year. We wonder what will be found to delay next year's start.

E. B. Bronson has written for the October "American Magazine" an interesting description of a balloon voyage back in '74 which lasted 26 hours, a record for twenty-five years, in which he took part and of which he is the last survivor. The article is entitled "An Aerial Bivouac."

J. B. Pursell, of Chattanooga, has been working on a machine somewhat along the line of Santos-Dumont. A fire destroyed the greater part of it a few days ago.

On August 29 a wind storm struck the Iowa State Fair Grounds, blowing an electric wire against Knabenshue's airship, which caught fire and was destroyed, together with a captive balloon which he was operating.

In last month's "Chronology" it was erroneously stated that Bleriot made a flight of 165 yards. He made one flight of 125 metres and another one of nearly 150 metres, the distance being measured by M. Archdeacon.

Germany is now worried over the possibility of France obtaining details of her fortifications, etc., by means of airships. Alarmists are urging the passing of laws prohibiting foreign airships from navigating the free air above German land, and authorizing the destruction of such trespassers by "artillery or otherwise."

DISCOVERY—"Do you expect to discover the North Pole?"

"Not immediately," answered the arctic explorer; "for the present I am content with discovering new methods of discovering the pole."—Washington Star.

Does this refer to Wellman?

Cleveland Moffett will describe in the October number of McClure's the remarkable tactics by which Frank P. Lahm won the International Balloon Race in Paris, when America, competing against the greatest countries of the world, captured the famous Gordon-Bennett trophy, and thus brought it to this country.

Automotor Journal for August 24 has quite a lengthy article on the effect of wind on the speed of automobiles. Wind screens of various sizes, solid surface and gridiron, were placed on automobiles and time over a measured course taken. The figures obtained at various rates of speed are of practical interest to the aeronautical experimentor.

Joseph A. Blondin expects to start October 12, from Albuquerque, N. M., on a long distance trip in his new balloon, competing for the Lahm Cup. The start will be made at sunset and, figuring on the prevailing winds, the anticipated course is toward northern Texas, Colorado or Kansas. Hydrogen gas will be used and a trial made of two devices for economizing ballast which Mr. Blondin has invented. This should be an interesting trip, especially in view of the rare atmosphere at the start.

To carry out his part of the wager with Archdeacon, Santos Dumont is now at work on a hydroplane which he promises will make 100 kilometres an hour. The boat is cigar shaped, about 10 metres long, with the greatest diameter well forward. A 16 cyl. 128 h.p. Antoinette motor will supply the power.

Of considerable information to the aeronaut was a lecture recently given

in London which was illustrated with moving pictures of various birds in flight, starting flight, landing, etc. We believe this is the first time that an attempt has been made to secure pictures showing the continuous movements of various large birds.

Going the new de la Vaulx portable airship one better, Mr. Myers of Frankfort has devised and had in operation a complete dirigible which is veritably a "pocket edition." The bag folds up into a package two feet square the car forming another 20 x 20 x 30 inches, and the 36-foot frame reduced by telescoping to form a rack 8 feet long by 22 inches triangular section, weighing but 32 pounds. On August 23, at Saginaw, Michigan, this airship, which he has named "No. 23," attempted a flight in an 18 mile wind, against which the 7 hp. motor was not quite able to propel it. The wind slowly drove the ship back a distance of 6 miles where a landing was made at 7 p. m. Later the wind died down and at 11 o'clock the ship was back in Saginaw under its own power.

A. Q. Dufour, of 717 Cass St., Milwaukee, Wis., is experimenting with a gliding machine having the following characteristics: 9 feet long by 22 feet wide, the two planes being placed 4 feet apart; a rigid tail-piece 6 by 7 feet; elm framework, which he has found to be flexible and tough with small weight; mounted on four 14 inch rubber tired wheels; total weight, 120

Photo by E. E. Klein.

DUFOUR AEROPLANE.

Photo by E. E. Klein.

DUFOUR MACHINE IN FLIGHT.

pounds; operator, 150 pounds; 6 angle planes have maintained good equilibrium. To obtain momentum the inventor utilizes an inclined runway dropping 1 in 4 feet, 15 feet from the ground at the lower end, 40 feet long. Owing to the comparative great weight of the operator the glides have been short.

Carl E. Myers has for some time past been conducting some experiments at his "balloon farm" at Frankfort, N. Y., for the purpose of ascertaining how long hydrogen gas can be retained in a balloon without appreciable loss, the handling and decanting of gas from one vessel into another speedily and the operation of captives and airships for long periods exposed to all variations of weather. The extremes of hot, cold and rainy days were experienced during the early part of July when the rainstorms even wrecked buildings in the vicinity. Beginning the week of July 4th Mr. Myers operated a captive balloon, making a free flight in it in the late afternoon of July 4, landing for the night and starting again in the morning. The balloon was in practically

continuous use during five days without being re-inflated. Since July 6th this balloon, with others, has been almost continually inflated out of doors exposed to all weather.

On Monday, July 29, a motor airship was substituted, with which the same evening a Mr. Coughlin, of Dayton, made several flights to learn its control. Tuesday evening the same ship made several flights for further practice. Wednesday the gas from this ship was turned into another of exactly the same pattern and Mr. Coughlin left for Dayton with his ship, where he will use it for exhibition purposes, the other ship remaining out of doors. Up to August 2d the envelope was still tight. The fierce hail-storm of this date, no harm to the envelope and no gas was lost.

CORRESPONDENCE.

Editor, American Magazine of Aeronautics,
New York City.

Dear Sir:

My work with internal combustion motors has been entirely in connection with automobiles, but the reading of the article on light engines by Mr. Harry E. Dey in the latest issue of your periodical has brought up several points, regarding which I desire enlightenment. I realize that motors for this purpose may be radically different in design from automobile motors, for constant instead of varying speed is desired, and the freedom from road shocks permits the reduction of weight in webs, braces, etc.

The present development of these motors has been due almost entirely to the growth of the automobile industry, and the makers have devoted a vast capital of cash and time in the improvement of efficiency. Their goal has been the production of a motor of the greatest power for the least weight, and I should think that the results of their researches might be taken as the starting point in the design of a motor for airship work.

An internal combustion motor derives its power from the action of the heat units contained in the fuel, and the greater the volume of the charge that is drawn into the cylinder, the greater will be the pressure developed by its combustion. The compression of the charge is, of course, a great factor, and the more the charge is compressed the greater will be the pressure developed, for the expansion of the gases will then occur within a more limited space. The advantage of compression, however, does not lie in this to the extent that is commonly believed, for its chief importance is that it provides a means of making the charge more uniform. Tests have shown that even the best of carburetors furnish a most imperfect mixture, and that a considerable proportion of the gasoline enters the cylinder, not as vapor, but as liquid in a finally divided condition. The function of a carburetor is not the mixing of the air and gasoline, but their proportioning, and the action in the cylinder during the compression stroke is depended on to combine the two elements, and to render the mixture more uniform.

The maker of an automobile engine strives to take into the cylinder the largest possible charge, and to compress it as highly as is possible without danger of preignition; to reduce the volume of the charge and to compress it to a greater extent, as suggested by Mr. Dey, would be against his principles. The limit of practical compression for air cooled engines is accepted as being from 50 to 55 pounds, a higher compression resulting in preignition. Preignition from high compression results in combustion so quick as to be almost a detonation, and this is a condition that must be scrupulously avoided. Combustion by the propagation of the flame, following ignition by spark, is comparatively slow, but ignition by high compression occurs in all portions of the charge at practically the same instant, and the pressure would be developed so suddenly that the piston—or cylinder-head would probably blow through before the inertia of the piston could be overcome.

To reduce the volume of the charge taken into the cylinder means the reduction of the number of heat units available, and a consequent lowering of the initial explosion pressure; the volume of the charge has nothing to do with the extent to which it may be compressed without danger of preignition. Unless the application of an internal combustion engine to the

propulsion of an air ship contains elements so subtle as to be understood only by the initiated, the reduction of the charge as a means of increasing the power would hardly seem logical.

The use of an automatic inlet valve as against the mechanically operated type seems a step backward to one familiar with automobile work, for experience has shown the necessity of providing a positive mechanism. A spring cannot be classed as positive, even when it is kept cool; and when it is enclosed in the inlet pipe, as the spring of an automatic valve must be, the chances against its remaining in proper adjustment for any length of time are greatly increased. The action of a mechanically operated valve is positive, being controlled by the action of a cam, and by a heavy spring that is exposed to the cooling action of air currents, and automobile makers are unanimous in their conclusion that the automatic valve is erratic, difficult to adjust, liable to stick, and not dependable. It is true that the use of an automatic valve means a reduction of weight, but it would seem to be at the expense of safety.

A long connecting rod will increase the efficiency of the engine, but will also increase the weight. Economy in the use of fuel is desirable, but when it is obtained at the increase of the weight of the engine it would seem a doubtful expedient. Greater length of connecting rod results in less piston side thrust, but this may be obtained with a short rod by off-setting the crank shaft. This reduces the side thrust during the power stroke, while increasing it on compression, and as the expansion pressure is higher than compression pressure, the crank shaft may be offset until the side thrust is equal for the two strokes.

The use of steel for cylinders has been the subject of much experiment, for its use in place of cast iron in saving of weight and smoothness of surface are obvious; but the difficulties of lubrication and the tendency to lose a true circular form have precluded its adoption. If the heating were uniform, it might be a different story, but for cylinders of practical size, the difference in temperature between the two ends has resulted in twisting and warping. In this connection, the use of a cast iron piston in a steel cylinder might be questioned, for the difference in their co-efficients of expansion, (untempered steel .00001198, cast iron .00001234) would indicate a liability of the piston to sieze.

As I have stated, these comments are made from the automobile point of view, which prevents the free acceptance of the statements, but if the use of internal combustion engines for air ship work involves a deviation from accepted principles, I might suggest that the production of a successful and reliable motor for the purpose would be facilitated if automobile engine designers could be informed of the exact requirements.

ROGER B. WHITMAN,
Technical Director, N. Y. School of Automobile Engineers.

Editor American Magazine of Aeronautics:

Will Mr. Samuel A. King, of Philadelphia, kindly let us know through your columns the dimensions of the balloon he used at Minneapolis in September, 1881.

This balloon was claimed to be the largest ever constructed at that time. It certainly was a beauty, the form being simply perfect from an artistic standpoint, and it was a most inspiring sight to the fifty thousand people that witnessed the ascent.

I have often wondered why this balloon is never mentioned among the big balloons of the past.

This balloon was filled with hydrogen, and it was the intention to make the trip from Minneapolis to the Atlantic Ocean. In addition to Mr. King there were several reporters and a weather man. They became becalmed after going about half a dozen miles and descended to camp over night in a cow pasture half way between Minneapolis and St. Paul. A gale of wind came up in the night which lasted nearly a week. This caused them to abandon the trip.

My business at that time took me to Minnehaha Falls every day and I well remember the appearance from there of the great dome projecting so far above the tree tops. It was too bad to have a trip that was so well provided for, and started so auspiciously, spoiled through somebody's fool idea of camping out for the night on Mother Earth.

HARRY E. DEY.

NEW AERONAUTIC BOOK.

The Development of Motor Airships in the Twentieth Century, by Major Gross, the Commander of the Royal Prussian Airship Battalion, illustrated. The solution of the problem of the dirigibility of airships has been more nearly approached by the present successful experiments with motor airships than at any previous period, especially with the Patrie and the Zeppelin. In this exposition a concise demonstration is given of the progress made with modern airships, especially the advantages and disadvantages of the present proposed three types—the rigid Zeppelin, the semi-rigid Lebaudy, and the pliable Parseval. The book is published by Otto Salle, Berlin, W. 30, price 1 Mark. Printed in German.

A REMARKABLE COLLECTION OF PRINTS, CUTTINGS, ETC., RELATING TO BALLOONS AND AERONAUTICS.

This comprises three volumes of loosely bound pages, 14 x 16 in., on which the items are mounted on one side only, and a portfolio containing about 40 large prints, water-color drawings, lithographs, etc., mounted on cardboard 22 x 15, also a miscellaneous collection of music, posters, caricatures, etc., relating to the subject.

Among the items in the collection are:

Genuine contemporary accounts and illustrations of early experiments and the first balloon ascents (1783). Six different contemporary illustrations of Lunardi's balloon (1784). Portraits of the following: Montgolfier (2 different), Charles (3), Dr. Black (2), Cavallo (2), Lunardi (4), Blanchard (2), Sadler (2), Garnerin (2), Green, and many others. Colored caricatures by Rowlandson, Cruikshank, and others. Autograph letters and signatures by Green, Coxwell, Simmons, Burnaby, etc. Complete illustrated article on "Aerostation" from Encycl. Londinensis. Many items printed at C. Clark's private press. Full illustrated accounts of Lunardi's and Blanchard's ascents (784), Major Money's descent in the sea (1785), Garnerin's parachute (1802), Cocking's parachute and accident (1837), Hampton's parachute (1839), Nassau balloon, Monk Mason's airship (1843), Henson's aerial steam carriage (1843), Coxwell and Glaisher's ascent (1862), "Le Geant" disaster, Franco-Prussian war, Arctic propositions, Loss of Mr. Powell (1881), Crossing of Channel by Burnaby (1882), Baldwin parachute (1888), Maxim's experiments, Lilienthal (1893), Andree's Polar balloon, Langley's and Phillips's experiments, etc.

The whole is carefully arranged in chronological order, and forms a complete history of ballooning and aeronautics from the earliest time to the twentieth century.

This collection is absolutely unique, and no amount of money would be likely to secure a similar lot without years of trouble.

It is certainly one of the most complete collections on the subject in existence. It is now for sale at $600.

AERONAUTICS IN THE CURRENT MAGAZINES.

Everybody's for August contains an exceedingly interesting paper on "The Mystery of Bird-Flight," by Harold Bolce. The action of the various birds in rising from the ground, sailing and landing is discussed in a most sensible way. The article is particularly noteworthy for its photographs. It is not an exposition of a flying machine but a mere statement of curious facts and to the student of aviation it will provide new ideas.

GORDON BENNETT NUMBER

AMERICAN MAGAZINE

— OF —

Aeronautics

SUMMARY

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Published by

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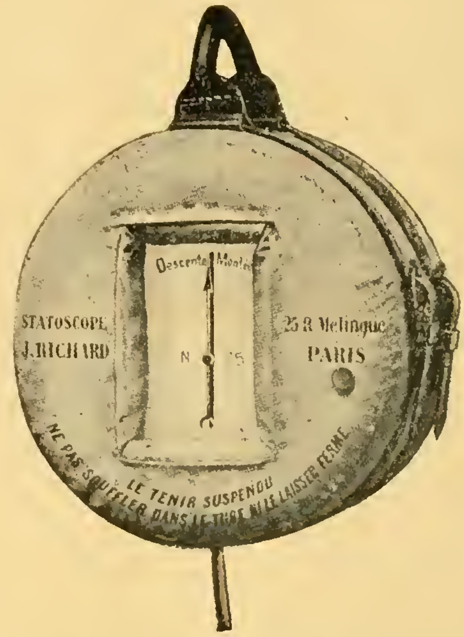

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American Magazine of Aeronautics.

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ERNEST LARUE JONES, EDITOR AND OWNER

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THAT PRIZE—ONCE MORE!

It is possible that the Aero Club may merit some of the frequent criticisms that it is not doing what it might for the advancement of the science to which it is pledged.

Of course, as can easily be reasoned by any sensible person, the Club cannot be expected to avail itself of the countless opportunities to finance the construction of machines guaranteed by their inventors to fly on half a trial. This would surely necessitate the assistance of Mr. Bishop's "Croesus."

But it *can* offer cash prizes for flights, by gasless machines, of ever increasing distances. The inventor would then have something concrete to aim at and it would make producers of the many whose energies are now latent for lack of a stimulus.

We trust there is no need of repeating the various conditions now confronting the inventor of aerial apparatus. We believe these have been quite fully set forth in previous issues.

We suggest herewith a most feasible plan of securing such a prize, or prizes,—a plan that will appeal to the business man and the capitalist in the light of an actually good investment.

Let us contribute—200 of us—$25.00 each, making a sum of $5000. This will do nicely as a basis for the future. Offer this to the inventor, in America, who will first fly a given distance, say, 1000 feet, on condition that in case he wins the prize, the two hundred contributors to this sum will share a one-fourth interest in the invention. This gives the capitalist something to show for his investment, the inventor has a cash return for his labors, and we are all in shape to form a working corporation. The outlay of each member of this syndicate is ridiculously small but the aggregate is fairly large. The inventor gives but a fourth interest and has a business basis upon which to work. If one member wishes to subscribe for more than one share, that is his privilege.

There are several machines now building or built in this country which give promise of results. There may be some of which we do not know. Of course, it is understood that this is not open to the Wright Brothers.

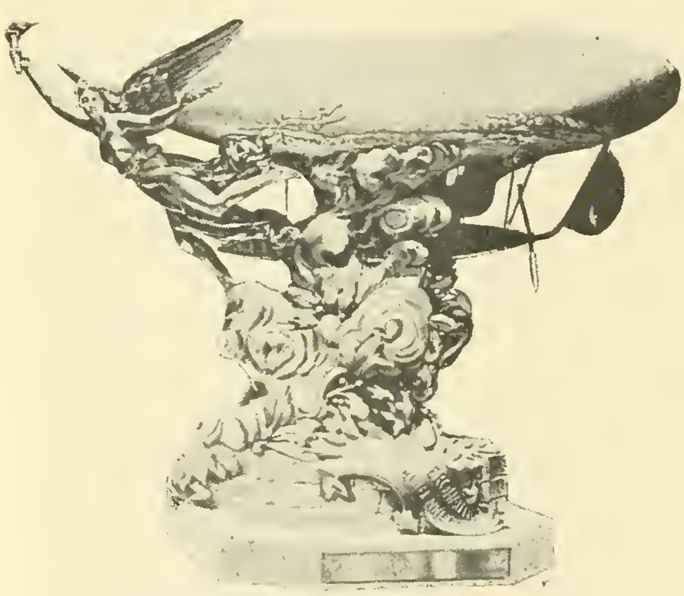
We want to appeal to our readers and ask their suggestions. Now is the time—not to-morrow. We have mentioned this idea to several of our friends who are glad to aid. To make a definite start, we add their names.

American Magazine of Aeronautics.
Lee S. Burridge.
Wilbur R. Kimball.
Octave Chanute.
Thos. G. Washburn.
A. L. Westgard.
Alan R. Hawley.
William Hawley.
George M. Kirkner.
Dr. C. T. Adams.
Chas. Jerome Edwards.

GORDON BENNETT RACE.

On October 21, at Saint Louis, for the second time since its offering, some of the best balloonists in the world will compete for the Gordon Bennett International Aeronautic Cup.

This now most famous of all ballooning trophies was given, in 1906, by Mr. James Gordon Bennett, the proprietor of the *New York Herald,* whose gift to the automobile world has done so much to stimulate the sport of automobile racing. Up to September 30, 1906, there had not been an actual "international" balloon race. Many had been so called but it remained for Mr. Bennett to give to balloon racing a truly international aspect.



GORDON BENNETT INTERNATIONAL AERONAUTIC CUP.

This cup, of the value of $2,500, and $2,500 in cash in addition, was placed in the custody, for the time being, of the Aero Club of France and was contested for the first time at Paris, September 30, 1906. Again this year Mr. Bennett generously provides $2,500 in cash to the winner, besides the cup. Supplementary cash prizes to the extent of $2,500 are offered by the Aero Club of St. Louis to those contestants finishing second, third, fourth and fifth.

Last Year's Race.

There are few who do not know the story of Lieutenant Frank P. Lahm's victory with Major Henry B. Hersey over fifteen of the most skillful pilots in Europe: how, starting twelfth from the park at St. Cloud, they crossed the English Channel by night, not knowing whether the wind would change and blow them out to sea; on over the English towns and villages almost to Scotland, landing finally at Fyling Dales, a distance of a little over four hundred miles.

Lieutenant Lahm was born at Mansfield, Ohio, November 17, 1877, entered West Point in June, 1897, and became a lieutenant of cavalry. After two years' campaign in the Philippines the young officer was detailed, in 1903, as instructor of French again at West Point. He joined the Aero Club of America but before he had an opportunity to make an ascension under its auspices was sent to the French cavalry school at Saumur, France, as foreign attache. There, under the tutelage of his father, a veteran aeronaut, he made many ascents and qualified as a pilot of the Aero Club of France.

LIEUT. FRANK P. LAHM.

When the Gordon Bennett race was announced, the Aero Club of America immediately began to look for its champions. The short space of time prevented anyone from going from here and Lieutenant Lahm and Santos Dumont were named by cable to represent the Aero Club of America.

At the last moment before the start, Charles Levee, who was to acompany the Lieutenant, was forced to withdraw and it looked as though he would have to go alone. But Major Hersey, of the Wellman expedition and at one time attached to the U. S. Weather Bureau, offered his services as aide just in the nick of time. That they were accepted with the greatest of pleasure you can be assured.

It was five o'clock when the start was made in the "United States," a balloon belonging to Mr. Frank S. Lahm, Lieutenant Lahm's father. At eight o'clock it began to grow dark and lights twinkled in the little French villages near the coast. The cross-channel trip cannot be told better than by the Lieutenant himself and we quote his description from "Navigating the Air:"

"At seventeen minutes past 11 p. m. we slipped quietly out over the English Channel, the end of the guide-rope just off the water, and began the second and most interesting part of our trip. Our direction on reaching the Channel would have taken us out to the southwestern extremity of England, but again the wind veered and we were traveling west of north.

"To describe the beauty of the Channel crossing would require the pen of a master. With a full moon shining overhead, an almost cloudless sky, the balmy air, and, except for the gentle breaking of the waves beneath us, not a sound to disturb the perfect calm, nothing could be more charming, nothing more delightful. With occasional reference to the compass and North Star, we knew our direction was good, so had no uneasiness on that score. Sitting on the bottom of the car on the ballast bags, occasionally looking over to see if the guide-rope was clear of the water, if not, throwing out a scoopful of sand to send us up a few feet, we quietly ate our long-postponed dinner of sandwiches, chicken, eggs, fruit, coffee and other good things which we had laid in before starting. Once a little sailing vessel slipped under us and disappeared in the night. This was the only sign of life we saw in the Channel. The revolving light on the coast at Havre was on our right at the start, but we soon left it behind.

"At 2.30 a. m. a revolving light appeared ahead of us, and we knew we were approaching the English shore. On coming closer we were able to recognize that this light was on a light-ship. An hour later we were over the terra firma of old England. Soon afterward the lights of a large city appeared on our left. We knew this must be Chichester, in the county of Sussex.

"Then the friendly moon deserted us, and heavy mists covered up the lowlands, so that we lost sight of the earth, catching only an occasional glimpse of the black tops

of the trees under the end of the guide-rope. The first color of dawn showed itself in the east before five o'clock, but due to the mist and fog, it was past six before we were able to distinguish clearly the ground beneath us. We were forcibly impressed with the fact that the English farmer is not an early riser, for the loud and continued shouts of my companion did not bring forth a response until past seven. Then we learned that we had crossed the counties of Sussex and Hampshire in the fog, and were then over Berkshire.

"All morning we journeyed up over England, past Warwick Castle, past Stratford-on-Avon. Then the warm sun came out, heating and expanding the gas in the balloon and carrying us higher and higher in the air.

"At two o'clock in the afternoon we had reached an altitude of 10,000 feet. As we rose higher, our direction changed to east of north. From the direction of clouds at a lower level than ourselves, and of the smoke at the ground, we knew that the lower currents of air would take us farther to the west, so we started down in the hope of being able to change our direction sufficiently to take us into Scotland. A few minutes more brought us to the brown and barren moors, and then the coast of the North Sea loomed up straight ahead of us. It was necessary to hasten the descent, so I opened the valve and allowed a good supply of gas to escape. Down we came until the guide-rope was trailing on the moors. We knew it was just a question of minutes until we should be at sea; but as the wind had changed slightly, we hoped to continue long enough to reach a more settled district, and possibly a railroad station. A few minutes more and we had reached the edge of the moors; then a little railroad appeared to the right, running along the coast. Another minute and a small station was in sight. A farm-house ahead looked inviting, so we decided to land. But I had overestimated the gripping power of my anchor, for on striking the ground it tore up a little sod, then let go, and the wind carried us on. A stone wall served only to twist the shank of the anchor.

"Finally, due to the loss of gas, the car struck the ground in a field a half mile past the house, jumped up just high enough to clear a stone wall, came down again, turned on its side, dragged a few yards after the tugging balloon, then stopped. On striking the second time, I pulled the "rip cord" which tears a large strip out of the top of the balloon. The gas rushed out, and our good steed which had carried us so many miles lost his strength and lay stretched out on the meadow, a flat and empty bag."

Thus was won for America this magnificent cup. The other representative, Santos Dumont, fell by the wayside after having covered some eighty-seven miles.

This Year's Race.

Unfortunately, Lieutenant Lahm, America's first choice, will be unable to compete at St. Louis and it is expected that Major Henry B. Hersey, his alternate, will take his place. It is also regrettable that there will be but nine balloons in the coming contest. Spain had entered two balloons, as well as Italy, but on account of their not technically complying with the rules regarding the entries the Federation saw fit to bar them from this contest. Of course, the small number of competitors adds greatly to the chances of each but our own contestants have been most anxious that the number of starters should be as large as possible and have expressed their regrets that the love of sport did not weigh somewhat in judging the irregular entries. Switzerland, also, desired to compete but was late in making up her mind. It might be suggested that the date for the closing of entries be advanced from February in each year to a month or two later.

The contestants this year are as follows:

America—Aero Club of America. Major Henry B. Hersey in the "United States," 2,100 cubic metres capacity; Alan R. Hawley in the "St. Louis," 2,200 cubic metres; J. C. McCoy in the "America,"of 2,200 cubic metres. Augustus Post

will accompany Mr. Hawley and with Mr. McCoy will go Captain Chas. De F. Chandler.

England—Aero Club of the United Kingdom. Griffith Brewer and the Hon. Lieutenant Claud Brabazon in the balloon "Lotus II," of 2,150 cubic metres. This is the same balloon as was used by Santos Dumont in last year's race, having been revarnished and repaired.

Germany—Deutscher Luftschiffer-Verband. Oscar Erbslöh in the "Pommern," 2,200 cubic metres; Captain Hugo von Abercron and Hans Hiedemann in the "Düsseldorf," of 2,250 cubic metres; Paul Meckel in the "Tschudi," of 1,300 cubic metres.

France—Aero Club of France. Alfred Leblanc and M. Mix; Rene Gasnier and Chas. Levee. The names of the balloons are not yet known.

The balloons "United States," "Pommern," "Lotus II" and the "Düsseldorf" were participating balloons last year. Major Hersey was companion to Lieutenant Lahm, Griffith Brewer was companion to Frank H. Butler and Erbslöh was companion to Abercron in last year's race.

The only American made balloon in the race is that of J. C. McCoy, manufactured by A. Leo Stevens.

ALAN R. HAWLEY.

All honor to Mr. Bennett, the Aero Club of America, and the competitors!

MAJ. HENRY B. HERSEY.

J. C. MCCOY.

Arrangements.

A special Contest Committee has been appointed to judge the contest as follows:

Cortlandt Field Bishop,	Samuel H. Valentine,
Maurice Mallet,	L. D. Dozier,
Augustus Post,	Frank S. Lahm,
Chas. Jerome Edwards,	Chas. J. Glidden.

Captain Hildebrandt will supervise the inflation of the German balloons, Maurice Mallet the French and A. Leo Stevens the American.

The start will take place in Forest Park, where special pipes have been laid. viewing stands erected and everything possible done to make the affair pass off smoothly.

Most of those who go to St. Louis will take the "Southwestern Limited" of the New York Central, leaving at 2:00 p. m., Thursday, October 17, arriving at St. Louis the following day at 5:00 o'clock p. m. This train is equipped with Pullman observation cars, buffet-library, smoking car, dining car, barber shop, stenographer and maid.

The field instruments for the use of the Contestants have been loaned to the Aero Club of America by M. Jules Richard.

Subsidiary Contests.

At the same time, the Lahm Cup, offered by the Aero Club of America, is available for competition, to be awarded to the competitor of affiliated clubs who in America exceeds Lieutenant Lahm's record of 402 miles.

The Aero Club of St. Louis will hold on the following day, October 22, contests between dirigible motor balloons and between "gasless" flying machines, $5,000 in cash being offered in prizes. Full details and rules have been published in this magazine in previous numbers. The Scientific American trophy is available for competition.

FLYING MACHINE AND AIRSHIP COMPETITIONS AT ST. LOUIS.

For the first time in history, so far as we know, there is expected to be actual "races" between gasless flying machines at St. Louis. At least two have actually entered machines: Mr. H. C. Gammeter, of Cleveland, with an orthopter, and S. Y. Beach, of the *Scientific American*, with an aeroplane. Mr. Beach is trying his best to finish the machine in time and it is the hope of everyone that it will be possible for him to be present.

Messrs. Baldwin, Strobel and Cromwell Dixon, the fourteen-year-old boy who recently constructed and successfully flew a small airship, have announced their intention of competing for the dirigible prizes.

These competitions will occur on Tuesday, October 22, the day after the start of the Gordon Bennett, under the auspices and control of the Aero Club of St. Louis. $2000 cash goes to the winner and $500 to the contestant winning second place in each of the two types of contests. A three-quarter mile course is provided for the airships and a flight of one hundred feet must be made by the heavier-than-air machines in order to be eligible to the prizes.

AERO CLUB OF AMERICA.

New Members.

F. F. Fletcher, Newport, R. I.
G. H. Curtiss, Hammondsport, N. Y.
Hon. James M. Beck, 47 E. 64th St., New York.
H. C. Gammeter, Cleveland, O.
Albert C. Triaca, 146 W. 56th St., New York.

September Ascensions.

Sept. 5.—Colonel and Mrs. Fleischmann and A. Leo Stevens in the Stevens 21, 1000 cubic metres, at North Adams. The balloon moved slowly up the valley over Stamford, Vt. At Hartwellville it disappeared in the clouds. The landing was at Meriden, N. H., 127 miles. Time in the air, 4½ hours.

Sept. 15.—Charles J. Glidden and M. Leon Barthou, of the French Ministry of Public Works, in the Aero Club No. 2, 1550 cubic metres, at St. Cloud, 11:46 a. m. Descent between Yevre-le-Chatel and Yevre-la-Ville, near Pithiviers, at 3:46 p. m. Highest altitude, 9266 feet. Distance 52 miles. This was Mr. Glidden's first "run" in the air.

Sept. 21.—Captain Charles De F. Chandler and J. C. McCoy in the Army No. 10 at Washington, D. C. Descent at Harmon, 9 miles from Baltimore. Time in the air 2½ hours. Altitude reached, 4000 feet.

Sept. 30.—Captain Chandler and J. C. McCoy in the Army No. 10, at Washington, D. C. Landing at Princess Anne, Md. Crossed over Chesapeake Bay during flight. Distance 26.5 miles.

Membership Cards.

Membership cards for 1907 are being issued to members in good standing.

International Race.

Members are urged to take upon themselves individually to aid in every way possible to make the visit of our foreign colleagues a pleasant and enjoyable one and are requested to come to the Club as often as possible. The club is open every evening. Monday and Friday nights are special "Club Nights" and there is always a goodly number present. Those intending to visit St. Louis at the time of the race should send in their names at once in order that proper arrangements can be made.

THIRD ANNUAL EXHIBITION.

The Aero Club of America will again this year join hands with the Automobile Club of America and hold its Third Annual Exhibition of aeronautic apparatus at Grand Central Palace, New York, October 24-31.

On account of the aeronautic exhibit at Jamestown it was thought that it might be difficult to arrange a successful exhibition, but the Club has met with agreeable surprises and it is not unlikely that this one will surpass the two previous. In addition, it has been possible to obtain all the exhibits from Jamestown.

Among the exhibits will be found the following: *Balloons*—Nirvana of Dr. Julian P. Thomas, Initial of Alfred N. Chandler, America of J. C. McCoy, Psyche of J. C. McCoy, St. Louis of Alan R. Hawley. The America and St. Louis are competing balloons in the International Race. It is also expected to have on exhibition the balloons of the foreign contestants in this race. *Dirigible Balloons*—Santos Dumont No. 9, Smithsonian Institution; the California Arrow, Captain Thos. S. Baldwin; one from Charles J. Strobel; New York. Dr. Thomas; two from Capt. T. T. Lovelace; No. 23 of Carl E. Myers. *Aeronautic Motors*—Aero & Marine Motor Co., G. H. Curtiss Mfg. Co., Prospect Motor Co., the famous Antoinette motor from Adams Mfg. Co. *Full Sized Flying Machines*—Orthopter of H. C. Gammeter, Aeroplane of S. Y. Beach, W. M. Keil's gliding machine. *Models*—Airship, C. Buschner; kite balloon and regulation balloon, August Riedinger; airship, Peter Tkatchenko; aeroplane, A. V. Wilson; glider, Louis H. Hall; flying machine, Carl Hartman; flying paper models, William Morgan; 8-wing aeroplane, William

A. Eddy; flying model helicopter, W. R. Kimball. *Fabrics*—Continental Caoutchouc Co. *Kites*—Henry Rodemyer, C. S. Wardwell, Silas J. Conyne. *Miscellaneous*—Bearings, Wm. J. Brewer, C.E.; propellers, Carl Hartman; drawings and photographs of proposed machines; photographs of various balloons and airships, aerial photographs, etc.; model electric advertising balloon, Lord Electric Co.; balloon wireless outfit; an educational exhibit of the American Magazine of Aeronautics; balloon cameras, lenses., etc., C. P. Goerz, American Optical Co. Exhibits are constantly coming in and the list will be considerably longer by October 24. Moving pictures of the International Race will be shown daily during the Show on the same floor.

The Aero Club has been favored this year in obtaining the third floor of the Palace instead of being placed near the roof as last year, thus avoiding the crush and annoyances connected with the viewing of the exhibits in 1906.

JAMESTOWN AERONAUTICAL CONGRESS.

On October 28-29 there will assemble in the Aeronautic Building at the Jamestown Exposition a notable gathering, for the purpose of presenting papers on the work of the past aeronautical year. It is regrettable that the unfortunate management of this Exposition should have prevented the elaborate plans from being carried out in their entirety. The lack of exhibits has been one result. Of balloon ascensions there have been but two, and a half dozen dirigible flights. To obtain a special building for this particular branch of science, however, was considerable of a thing and we have not been too much discouraged.

The committee has been favored thus far with the following papers:

"The Best Inclinations for the Surfaces and Propeller Shafts of Dynamical Apparatus," by T. W. K. Clarke, Assoc. M. Inst. C. E.

"Principles Involved in the Formation of Wing Surfaces and the Phenomenon of Soaring," by J. J. Montgomery, Ph.D.

"The Navigation of the Air," by Israel Lancaster.

"Experiments With Model Flying Machine," by Edward W. Smith.

Promised and to be received are the following papers:

"A Device for Extending the Area of Weather Reports," and "Lightning in its Relation to Aeronautics," by Professor Alexander G. McAdie, U. S. Weather Bureau, at San Francisco.

"The Use of the Gyroscope in Flying Machines," by Lieut. Robert Henderson, Chief Engineer of the U. S. S. "Missouri."

"On the First Observations with Sounding Balloons in America Obtained by the Blue Hill Observatory in 1904-7 at St. Louis," by Professor A. Lawrence Rotch, Director of Blue Hill Observatory.

"Kite Experiments and Observations at Mt. Weather," by Dr. W. J. Humphreys, Director.

A paper by Mr. S. P. Fergusson, of Blue Hill Observatory.

SCIENTIFIC AMERICAN CUP COMPETITION.

It was hoped to have a contest for this cup at Jamestown on September 14th and there were a number there to witness the trials. Owing to the incompleteness of the machines it was not possible to have the tests. There is now no date set but it can be competed for at any time upon due notice under the rules.

AERO CLUB ASCENSIONS 1907

Date	BALLOON	Capacity cu. m.	PILOT	PASSENGERS	START	FINISH	Distance Miles	OBSERVATIONS
Jan. 1	Orient	1000	J. C. McCoy	Alan R. Hawley	St. Louis, Mo.	Pearl, Ill.	86	
Feb. 14	Nebula	1274	Hon. C. S. Rolls	Mr. & Mrs. Max C. Fleischmann, Hon. Mrs. Harbord	Chelsea, England	Sevenoaks, Kent.	22	
" 21	Eagle	510	Capt. T. T. Lovelace	Dr. F. von Teuber	Kingston, Jamaica	....	....	Scientific observations of earthquake.
" 23	America	2200	J. C. McCoy	Augustus Post, Alan R. Hawley, A. Leo Stevens	Washington, D. C.	Crooms, Md.	15	
" 28	Eagle	510	A. Leo Stevens	Capt. T. T. Lovelace	Pittsfield, Mass.	Dalton, Mass.	4	Snowstorm. At 1067 m. altitude, 25° F. below zero. Carrier pigeons died from exposure.
Mar. 23	Initial	1000	Alan R. Hawley	Alfred N. Chandler	Philadelphia, Pa.	Nr. Atlantic City, N. J.	50	
Apr. 15	Dutchess	623	Capt. T. T. Lovelace		Norfolk, Va.	Virginia Beach, Va.	17	Balloon had no rip cord; was blown to pieces on landing.
" 22	Initial	1000	Alan R. Hawley	Arthur T. Atherholt	Philadelphia, Pa.	Matawan, N. J.	59	Landed in creek.
" 26	Orient	1000	" "		St. Louis, Mo.	Carrollton, Ills.	60	
" 30	America *	2200	J. C. McCoy	Capt. Chas. de F. Chandler	"	Nr. Golconda, Ills.	135	Varying winds. Crossed and re-crossed sections of 5 States. Night trip. Duration 19 hours.
May 2	Orient	1000	Alan R. Hawley	A. Leo Stevens	"	Collinsville, Ills.	7	Varying air currents. Crossed same river 8 times at about the same spot.
" 23	Centaur	1200	A. Leo Stevens	Harry Markoe, Jr.	Pittsfield, Mass.	So. of Middlefield, Mass.	19	Gas very poor. Balloon ripped open by pressure at 7000 ft. altitude.
June 4	U. S. Army No. 10	2200	" " "	Capt. Chas. de F. Chandler, J. C. McCoy	Washington, D. C.	Nr. Linglestown, Pa.	104	
" 6	Orient	1000	Chas. Walsh	D. J. Haylon	Pittsfield, Mass.	Nr. Dalton, Mass.	5	Poor gas. Rain.
" 7	?	793	C. S. Rolls	Alan R. Hawley	Chelsea, London, Eug	Earles Colne, England	52	
" 8	Aero Club No. 4	1500	Chas. F. Pollock	Eustace Mortimer, Alan R. Hawley	Crystal Palace, Eng.	Little Stenpford, England	50	
" 13	Orient	1000	Capt. T. T. Lovelace	Wilbur R. Kimball	Jamestown Exposition	Jamestown Exposition	½	Gas too poor to be used.
" 14	Aero Club No. 2	1500	Alan R. Hawley	Frank H. Butler	Paris	Laag Depple, Holland	298	
" 20	La Mouche	1600	" "	Frank R. Cordley, Chas. Levee	"	Recken, nr. Dorsten, Ger.	285	St. Elmo's fire appeared on balloon.
" 29	Suffolk	1274	" "	Lord Royston	Ranelagh, Eng.	Bromley, England	9	Passed through hail storm at altitude 8000 ft. Won 2d place Hedges-Butler competition.
July 4	Carlotta * †	340	Carl E. Myers	Robt. Hopkins	Ilion, N. Y.	Fort Herkimer, N. Y.	3	
" 4	Nirvana	1714	Dr. Julian P. Thomas	"	Astoria, L. I.	Hunters Point, L. I.	3	
" 5	Carlotta †	340	Carl E. Myers	Mrs. Myers	Mohawk, N. Y.	Sloansville, N. Y.	50	Observed Parhelion. Compass reversed itself.
" 6	Aero Club No. 3	1200	Chas. Levee	Alan R. Hawley	Paris	Saarbruck, Bavaria	228	Won 5th place, Grand Prix d'Ete. Highest altitude, 14,432 ft. Night trip.
" 11	St. Louis	2250	Alan R. Hawley	Mr. & Mrs. Cortlandt F. Bishop, Mrs. Rob't Goelet, M. Mallet, Chas. Levee	"	Manneville, France	47	
" 12	You and I	623	A. Leo Stevens	Col. Max C. Fleischmann	Cincinnati, O.	Fort Thomas, O.	15	Most of trip over water.
" 17	La Mouche	1600	Alan R. Hawley	Wilbur Wright, J. E. Harrington, Chas. Levee	Paris	Charpentrie, France	70	
" 20	?	800	"	Chas. Levee	"	Caron, France		
Aug. 1	Stevens 20	623	A. Leo. Stevens	Wm. F. Whitehouse	Pittsfield, Mass.	Pittsfield, Mass.		Initial flight of new balloon. Gas so bad that no ballast or instruments could be carried.
" 7	" 20	623	"	" "	"	Windsor, Mass.	19	Poor gas again.
" 29	" 21	1000	"	" "	North Adams, Mass.	Somersville, Conn.	50	Initial flight of new balloon.
" 29	" 20	623	Alan R. Hawley	....	"	Indian Orchard, Mass.	43	
Sept. 5	" 21	1000	A. Leo Stevens	Mr. & Mrs. Max C. Fleischmann	"	Meriden, N. H.	127	

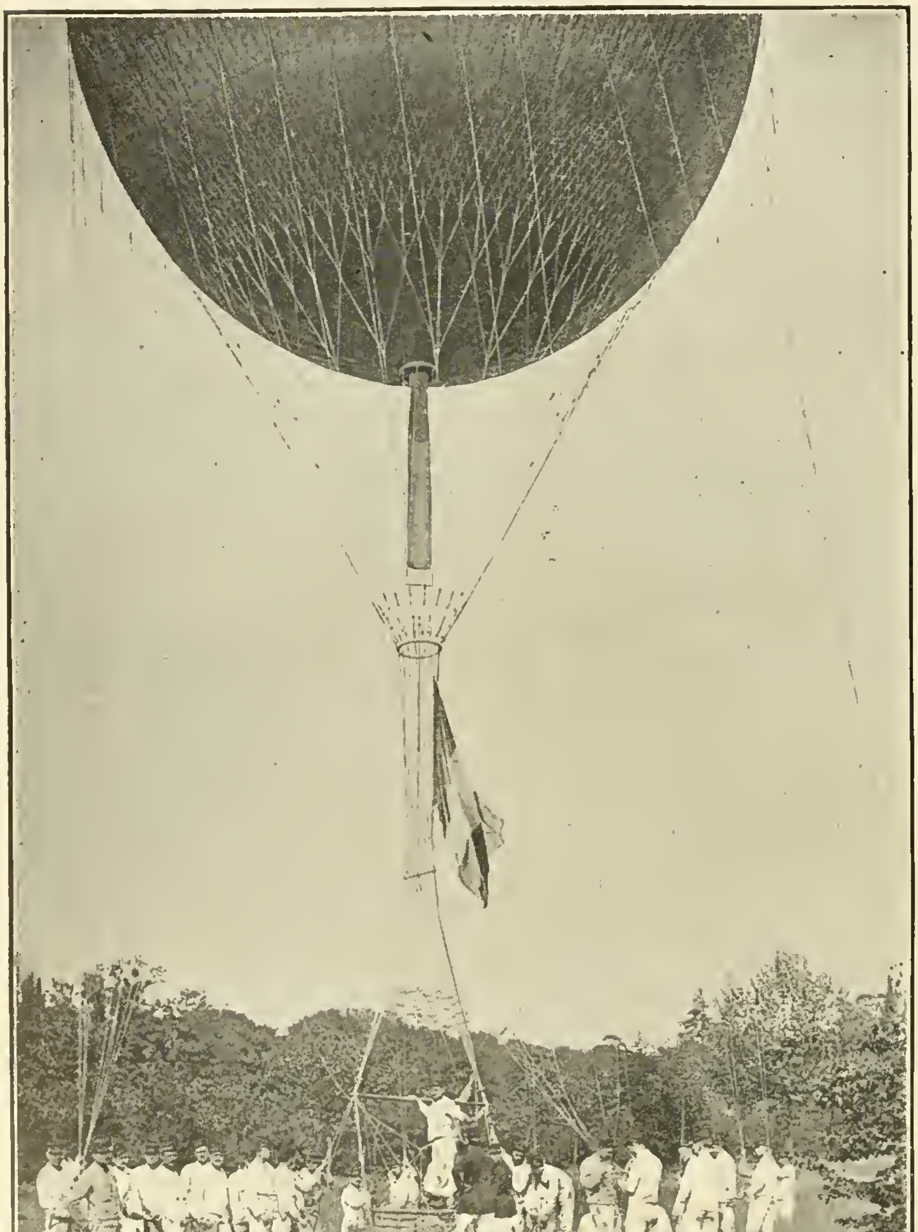
* Lahm Cup Competition.
† Hydrogen gas used.

THE PREPARATORY SCHOOL FOR MILITARY AERONAUTS. FOUNDED BY L'AERONAUTIQUE CLUB DE FRANCE.

By M. J. Saunière, President.

It was in the year 1794 that the Committee of Public Welfare thought to utilize captive balloons, upon the suggestion of M. Guyton de Morveau, to observe the movements of the enemy upon a battlefield.

The first trial was made by M. Coutelle with the first company of military balloonists during the siege of Maubeuge, since when it was tried by Charleroi at the battle of Fleurus, of illustrious memory, when he transported his inflated balloon, and in the year following assisted at the siege of Mayence. In 1815 Carnot reconnoitred at Anvers.



FRENCH CAPTIVE BALLOON.

Notwithstanding the indisputable services rendered by captive balloons in these various instances, it was necessary for the events of 1870, where the aerial post rendered well-known services, in order that, in 1874, the study of military ballooning should be taken up seriously.

It was then that the founding of the establishment of Chalais-Meudon, under the instructions of the regretted Colonel Renard, was accomplished and the complete creation of the system still in use.

Today, for the requirements of instruction, four companies of balloonists, distributed for four years in the different garrisons of the regiments of the engineers, are combined under the orders of Commander Aron, in the same battalion stationed at Versailles, where there is a park complete with shed and apparatus for the making of hydrogen.

At Chalais-Meudon is found the Laboratory of research for experimenting in

connection with military ballooning and the central headquarters for supplies in this connection.

The course of instruction is very complex, because, outside of ballooning, mechanics, and the making of the gas, it comprehends necessarily the school of the soldier and the main ideas of the work of the sapper, mines, fortifications and practical bridge making in the engineering corps. Pushing aside the difficulties which are presented under these conditions, the instruction of such a balloon corps, it seemed to the founder of the Aeronautique Club de France that a special preparation for young men desiring to enter service in this branch of the army could be easily organized. There was then created the Preparatory School for Military Balloonists, now seven years old.

The assistance which this institution has been to the Army could not be better stated than in the words of the first commander of the balloon battalion, Lieut. Col. Hirschauer: "The preparatory school of the Aeronautique Club is the nursery of the under officers of my battalion."

Instruction is given the young men in evening classes. The pupils are recruited from all professions and belong to all classes of society and they may follow the course without interfering with regular occupation. The professors, members of the Aeronautique Club, have given for the most part, their services to the engineers in the balloon department and are old pupils of the school, possessing all the qualities necessary to ably conduct the patriotic work which is entrusted to them and of which they acquit themselves with the greatest disinterestedness and most complete devotion.

The matters taught are relative to the construction and varnishing of the balloons, their handling, management, the manufacture and the properties of the gas, and the use of the instruments for making observations. The practice comprehends the process of filling the balloon with gas, sewing and rope making necessary in the construction and repairing of balloons.

Moreover all the pupils are compelled to practice gunnery and at long distance, (in 1906 more than 15,000 cartridges were fired).

This program completely realized permits not only the preparing of future military balloon experts but also of developing a taste for aeronautics and creating young men who could become on their return to service, capable aeronauts, having had real balloon practice.

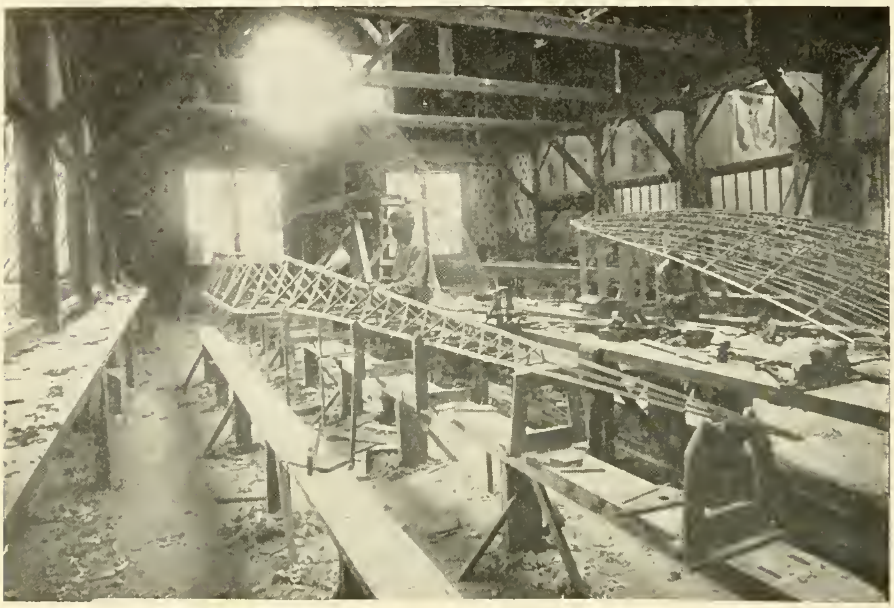
The patriotic work of the Aeronautique Club is then of double value compared with a work essentially commonplace?

But all the young men who follow the course during the year which preceded their departure to their regiment have not profited equally by the lessons received and a selection is made by means of examinations which they are made to undergo by a commission of officers appointed by the Minister of War and the pupils who have the best notes are put into a company of aeronautical engineers for a two years' service.

The importance of the school grows daily but not too rapidly, as aerostation seems sure to play in future wars a part of considerable importance by the presence of a new element of offense and defense, the dirigible balloon.

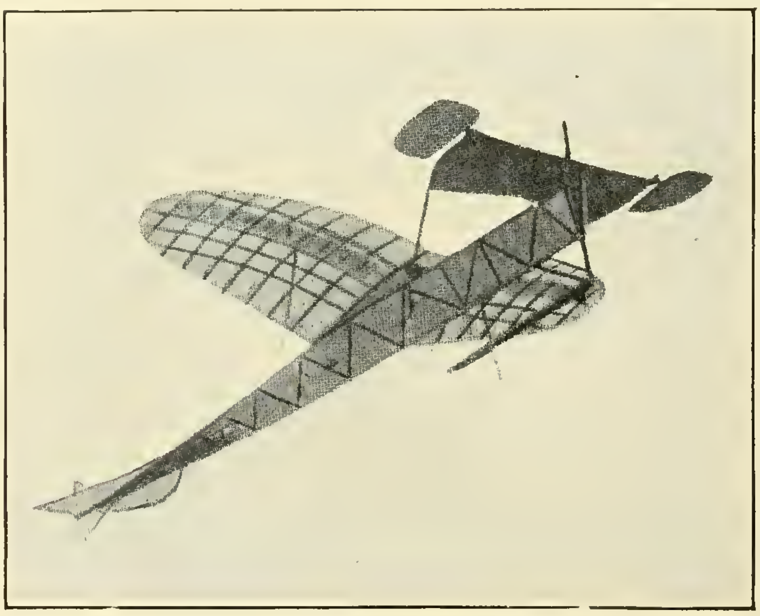
In the near future a French aerial fleet will be a reality, thanks to the balloons of Engineer Guillot, and one may be sure that the pupils of the Preparatory School of Military Aeronauts founded by the Aeronautique Club of France will form the best corps of its forces.

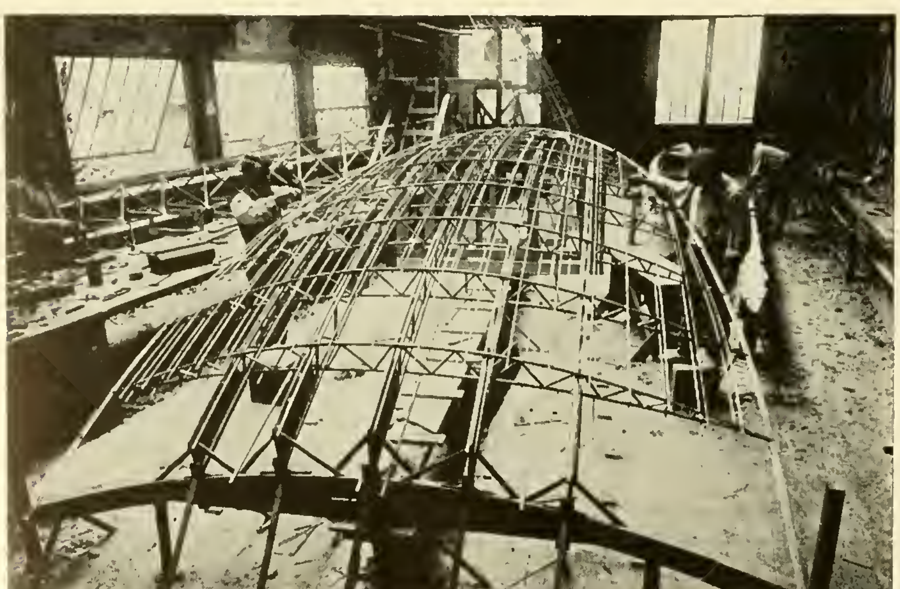
THE ANTOINETTE AEROPLANE.


The Automobile.

At the Lein shipyards in Perreux there is under construction a new aeroplane called the "Antoinette," the design of Capt. Ferber and M. Levavasseur, the maker of the motor known by that name. It is unique by reason of the fact that no wires are used to obtain rigidity.

It is shaped like a long fish, with a triangular section backbone of aluminum. Placed above at the head is a central plane at the lateral extremities of which are two smaller planes, the same triangular system of construction being employed. These two smaller planes are movable for the purposes of elevation and depression. A rudder at the tail guides the machine to the right or left. The entire apparatus, with a 100 h.p. 100 kilog. Antoinette motor will weigh, with the operator, Captain Ferber himself, not more than 500 kg. (1,100 lbs.). The propeller is 7.87 feet in diameter. It is expected to be finished within a few weeks.


THE ANTOINETTE AEROPLANE.


The Automobile.

The picture shown is that of the model which, it is stated, has flown very successfully.

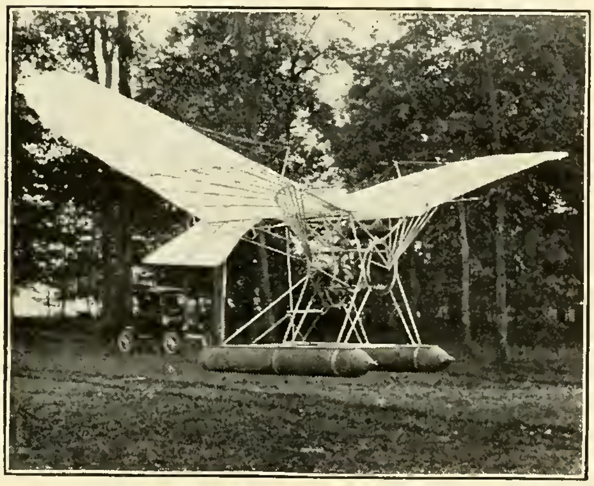
THE GAMMETER ORTHOPTER.

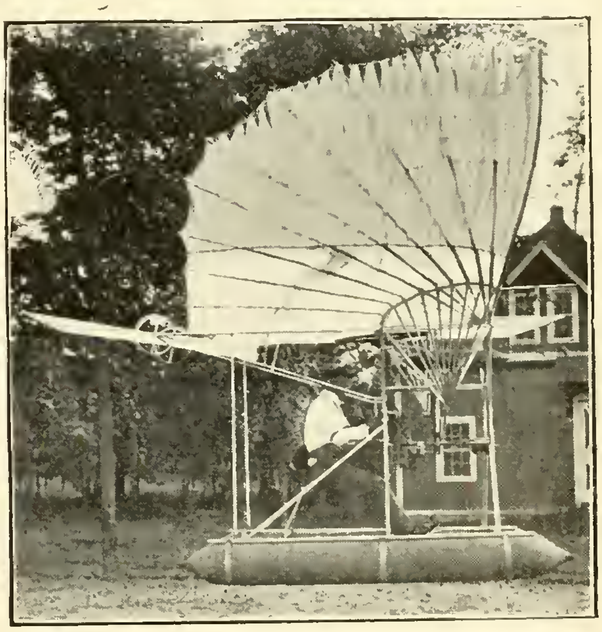
By H. C. Gammeter.

For several years past I have made a very careful study of the principles of aerial navigation and have kept in close touch with the experiments of such men as Langley, Maxim, Manly and others, besides devoting most of the past Winter in Florida studying bird flight. In this field alone much might be written but as space is limited I will say that my conclusions were, that as Nature exemplifies the highest type of perfection, I deemed it advisable to copy it as near as practicable for a beginning and thereafter modify it to suit conditions.

The wonderful lifting power of movable wings impressed me very favorably and appealed very strongly, especially as a means of arising, hovering and alighting. In my first experiment I shall depend entirely upon the wings, both for lifting and propulsion, as of course you will observe that the wings have rigid anterior and flexible posterior edges which latter act as propellers both in the up and down strokes.

The form of the wings is a close copy of Nature except the outer three-fifths





Photos by Moore & Brackett, Cleveland, O.

which are valvular, greatly reducing resistance on the up stroke, and, owing to the angle they take when open assist in propelling.

The feature in which my efforts have been exceedingly successful is the transmission which is not only exceedingly light and strong but very simple and reduces friction to a minimum. This consists of a light 20 inch gear of manganese bronze (preferably steel) containing a ball race cut into its face, leaving teeth upon both sides. This in turn revolves within a rigid split ring held in the frame of the machine and contains a corresponding groove for the balls. This ring at the bottom contains the bearing for a pinion from the clutch which latter is of an internal cone type and controlled by means of a lever adjacent to the steering wheel.

The connecting rods to wings connect to gear from opposite sides and clear the horizontal supports of ring. The wings are hinged at two points to the tubular frame 30 inches apart, from which two diagonals meet the braces from bamboo members and converge at a point in line with connecting rods. Thus it will be seen that the thrust of one wing is virtually in line with that of the other, permit-

ting a strong, light and ideal construction. This has been a stumbling block to many who believed in the superiority of flapping wings.

Only one rudder will at first be used, balanced and horizontal, and controlled by means of a cable to steering wheel, which latter also contains throttle lever and spark advance as in an automobile. The body of the machine is of steel tubing 16 to 22 gauge, while the wings are of bamboo covered with Japanese silk.

Although the last mentioned, yet foremost all through my experiments is the matter of stability. This important subject, without the complete mastery of which aerial navigation can never succeed, has been the great difficulty in all attempts thus far made and when success was finally achieved by Langley it was only after many discouraging failures which, of course, could not be made in a man-carrying machine. My first object was to obtain stability by means of a low center of gravity; means for shifting the weight of operator; and by keeping the area of planes as small as possible to eliminate the danger from wind gusts. More important perhaps than either of these is placing a horizontal flywheel in the center of the plane (this is to be enclosed). It is remarkable the amount of resistance this wheel at 1500 r.p.m. affords against a sudden change in any direction. After a careful study of the true gyroscope I abandoned it as being entirely too complex.

Provision is also made for a propeller but merely to test its efficiency, as I do not think I shall use it unless it is deemed desirable to do so after being thoroughly launched in the air, in which event the wings may be held stationary and propeller used.

Dimensions: width 30 feet, tip to tip; length 12 feet, including rudder; area of body, including rudder, 48 square feet; area of wings, 154 square feet; total area 202 square feet. Weight: 290 pounds including flywheel and fuel; 440 pounds complete with operator. Engine: 7 h.p. Curtiss; weight 50 pounds, 70 pounds with clutch; speed 1200 r.p.m.; speed of wings 75 per minute.

Tests. Owing to illness I had to defer outside tests but shall probably take them up again next week. Tests made inside of building showed very encouraging results. At 75 beats per minute the machine was lifted clear of the floor when the clutch was thrown in but failed to do so thereafter owing to confined area and lost inertia of air. When suspended, the machine showed approximate forward pull of 24 pounds. Transmission worked perfectly but bamboo is not as strong as it should be, owing to being softened in steaming and bending. This necessitated piano wire stays above.

THE INTERNATIONAL AERONAUTIC CONFERENCE AT BRUSSELS.

The International Aeronautic Federation, organized on October 14, 1905, in Paris, to formulate laws to govern balloon races, trials of dirigibles and flying machines, met this year in Brussels, September 12. To this conference the American delegates were Messrs. Cortlandt Field Bishop and Frank S. Lahm.

Little business was transacted and the affair took the aspect of a social gathering. On the 14th the delegates went to Antwerp where they were shown over the Military Balloon Establishment. In the evening they were entertained at a banquet given by the Belgian Aero Club.

Sunday afternoon occurred the start of the international race which was won by Oscar Erbsloh, one of Germany's representatives in the Gordon Bennett at St. Louis. The distance made by him was 603 miles.

The next congress of the I. A. F. will be held in England.

SOME CONSIDERATIONS OF THE HELICOPTER.

By M. Paul Cornu.

In the March number of *La Revue de l'Aviation* there appeared an interesting paper on the subject of the aeroplane by M. Armengaud. In this article he criticised the helicopter type of machine and the April number of the same esteemed journal contained an answer to the remarks by M. Paul Cornu.

It will be remembered that in 1906 M. Cornu conducted some experiments in which a small model was arranged to run along, and be checked in its rise, a telescopic rod which allowed it to rise about 6.5 feet. The machine elevated itself in the air most satisfactorily and maintained a steady course. It was driven by a 2 hp. motor which actually developed 1.5 hp. and the weight of the machine was nearly 31 lbs.

By request we reprint below M. Cornu's reply.

"We note a few objections relative to the helicopters to which we think we can answer, having constructed a number of devices with motors which have given very encouraging results, since they have lifted and operated under their own power, these experiments having been publicly noted and recorded in the Revue de l'Aviation. We are completing at this moment the construction of a model of this kind with a 24-h.p. Antoinette motor.

"M. Armengaud doubts that one can obtain as good results with the helicopter since there have not been worked out efficient propellers. This is the experience with all helicopters and is causing further experiments. Nevertheless, the plan must not be condemned for that, for the best propeller can certainly be found.

"In the course of this article the writer (Armengaud) demonstrates the superiority of the aeroplane over the helicopter through this example: the 50-h.p. motor of M. Santos acting upon the propeller gives a lifting force of 145 kilograms (319.65 lbs.) only, while the same motor driving an aeroplane sustains 300 kilograms (661.38 lbs.).

"According to this argument, the aeroplane forms a multiplier and this explains the difference; but if this multiplier were applied to the same propeller, that is to say, by giving a suitable pitch and proper dimensions, we can feel assured in depending not on a theory, but on a personal experiment, that the same motor of 50 h.p. would have lifted not 300 but 400 kilograms. Objection will be made that the aeroplane gives at the same time forward motion in addition to sustaining power, but with our helicopters we obtain equal propulsion without the loss of any new force. In the aeroplane the sustaining force is a consequence of the propulsion, while in the helicopter it is the propulsion which is the consequence of the sustaining force, and in addition we have natural stability which is so deficient in the aeroplane.

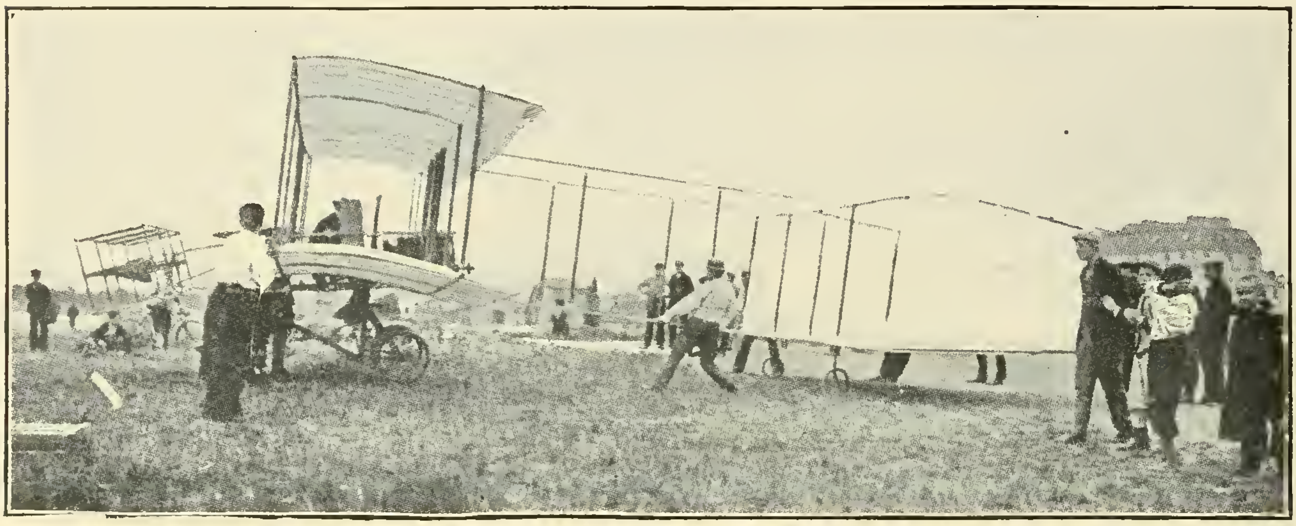
"If the aeroplane were actually superior to the helicopter nothing will prove that the latter will not catch up for the time lost, the former being merely ahead at the present time.

"In the automobile art it was the steam carriage which won all the first races, but this did not prevent them from being badly beaten by the gasolene engine. Perhaps it may be the same in aerial navigation. Between the aeroplane and the helicopter we believe all the more in the success of the latter, in that it is exempt from the difficulties of starting and landing, and has far more natural equilibrium.

"Progress is too often delayed by prejudices and false theories. Very often it has been said by even experienced investigators in the art. 'In the present state of air navigation the helicopter is impossible,' but the 'actual state of the science' the investigators nearly always (as well said by M. Archdeacon) modify it every day, and what appears a dream today can actually be the reality of tomorrow; besides, a number of encouraging features have been written us by a number of mechanics who, like ourselves, see in the helicopter the true mechanical solution of the problem of aerial navigation. An important communication has been made on this subject to the Academy of Sciences at Athens by the Naval Lieutenant Tsouchlas and Artillery Lieutenant Hakavas who both conclude in favor of the helicopter."

FARMAN AEROPLANE.

This has now been completed by Messrs. Voisin. The total surface is 559 square feet, measuring 32.8 feet in length by 33.456 feet in width. A 50-h. p.



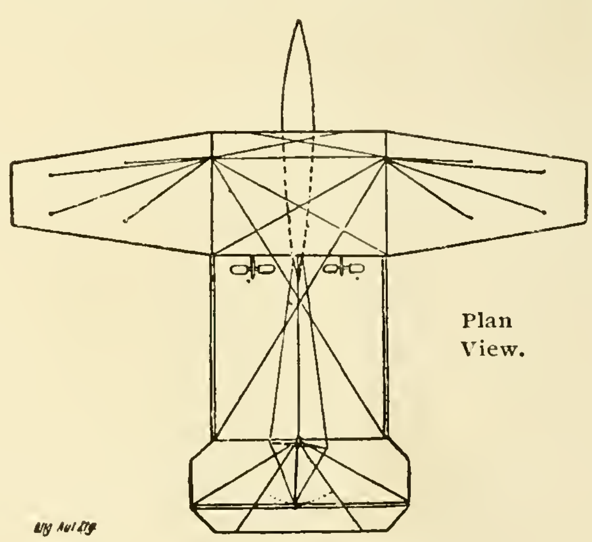
Automotor Journal.

motor drives a propeller 6.89 feet in diameter by 3.61 feet pitch. Total weight is 1100 pounds. You will note the curved planes and the large 2-plane horizontal rudder in front (right of photograph).

DE LA VAULX AEROPLANE.

In view of la Vaulx's statements that the gasless machine is impracticable, many will watch with more than ordinary interest the results of his experiments with this type of machine.

A main framework of rectangular section, 22 feet long, has been erected in the general form of a torpedo. Extending outwards on both sides and up is a rectangular plane, from the lateral extremities of which extend two other planes, the spread over all measuring 49 feet and provides 437 square feet of supporting surface. Nearly one half of the length of the main framework projects out beyond the front edge of the plane surface. Stretching out behind are two rods carrying the horizontal rudder. Above the horizontal plane is the vertical rudder. The single engine drives two 6-foot propellers located on longitudinal spindles above the middle plane. There are three masts, two at the junction of the central plane and the side wings, and one forming the axis of the vertical rudder. The surfaces are stayed by steel wires converging at the tops of the masts. The total weight of 880 pounds distributed as follows—body of machine 220 pounds, the aeronaut 220, the engine 154, fuel and water 110, parts and accessories 176 pounds.

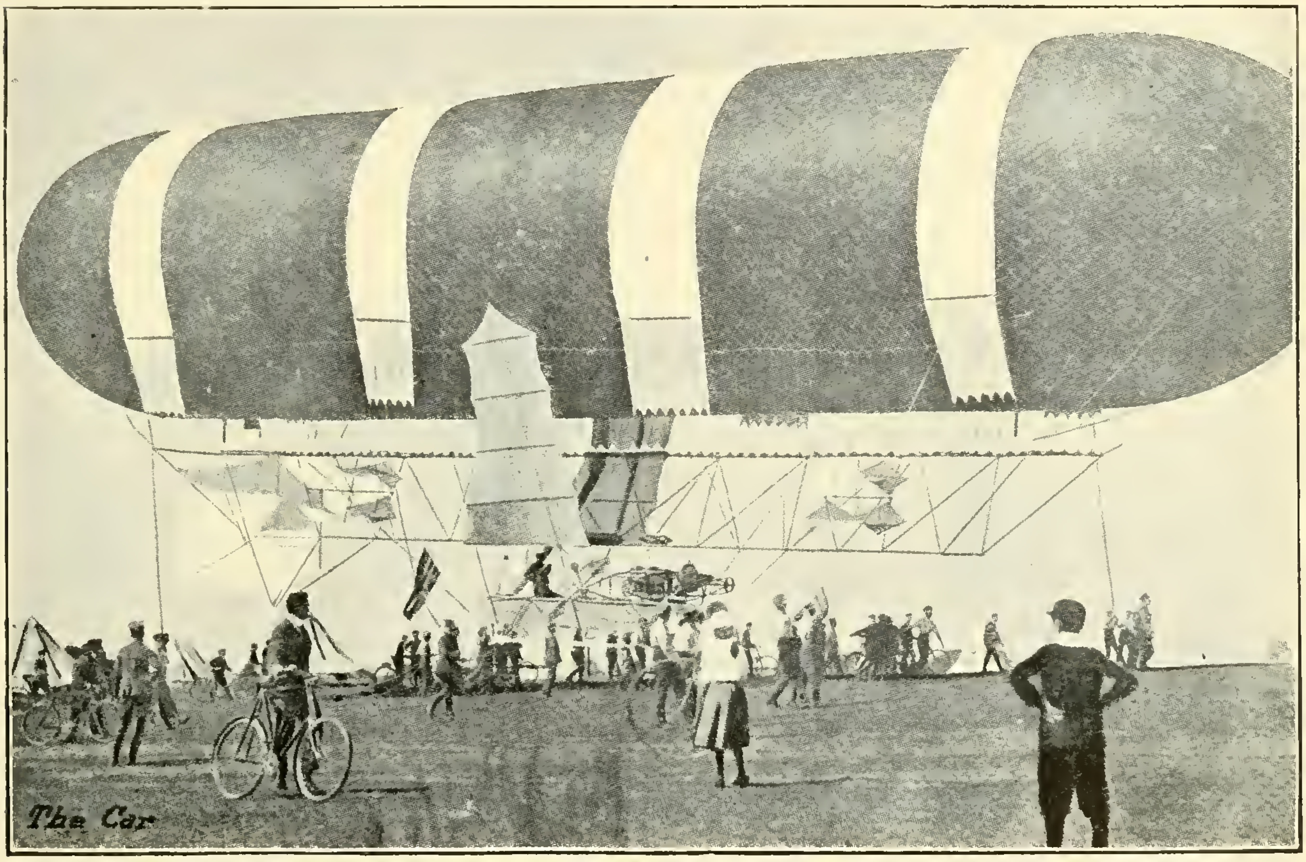


Plan View.

THE BRITISH MILITARY AIRSHIP.

France and Germany may now have a worthy rival in the aeronautic accomplishments of the first dirigible to be designed for war purposes by the English Government. While the first flight revealed numerous slips in judgment, still none that cannot be remedied.

The first trial was made on September 10, with Colonel Capper, Mr. Cody, an American of kite fame, and Captain King as passengers. The ship rose to the end of the rope, 150 feet several times and was pulled down each time in order to ascertain the force of the wind. Then it was allowed to rise to the height of about 400 feet and maneouvre over a distance of half a mile. After fifteen minutes work the belt driving the fan broke and a descent was made. In the afternoon a second trial took place in the presence of Colonel Templar, a couple of the wings having been removed. In trying to maneouvre too close to the ground the ship lurched and

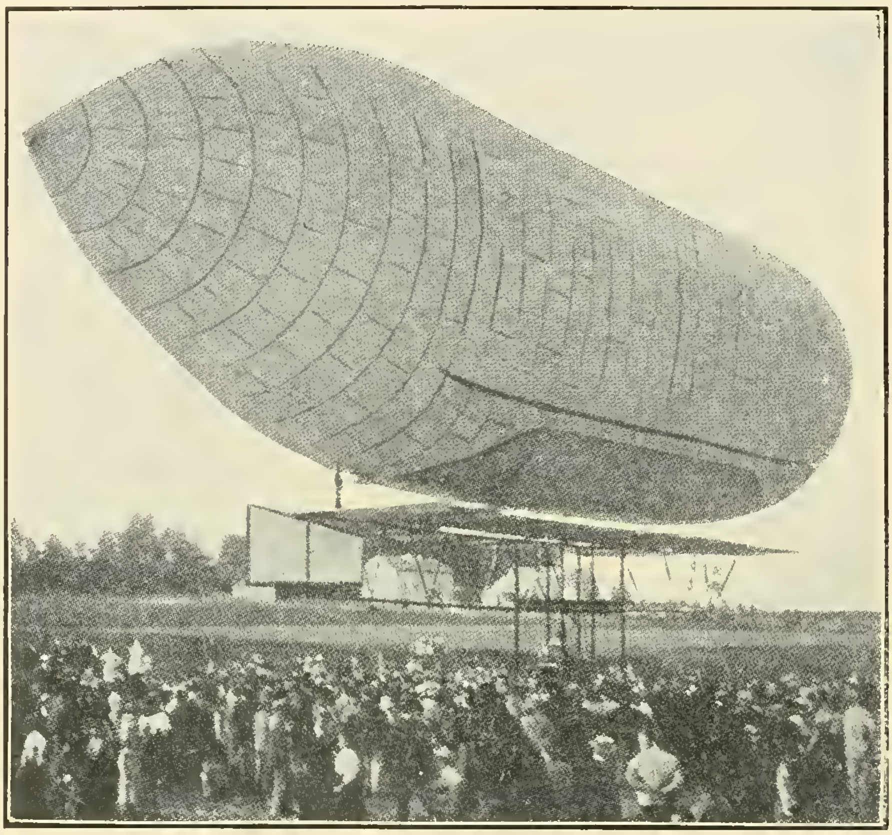

The Car

bent the framework somewhat. At five o'clock a third trial was made against the increasing wind and proved quite satisfactory.

Exact figures have been difficult to obtain and the length of the envelope is given as anywhere from 80 to 110 feet. The characteristics of the airship are as follows; blunt sausage-shaped 60,000 cubic foot bag of goldbeater's skin, having a diameter of 30 feet, encircled by four broad white silken bands which, with the net, support the triple framework; the space between the car and the envelope, 30 feet; a canvas covered, canoe shaped metal frame forms the 30-foot car, in the front of which is placed an 8 cylinder "V" motor driving by belts over wire spoked pulley wheels the two 10-foot 2-bladed propellers supported by a tubular girder extending crossways through the car; the motor is high up above the forward part so that the wire spoked flywheel is about in the center of the car. The torpedo shaped gasolene tanks are placed above on an intermediate framework; automatic device for regulating pressure in envelopes; the large hinged wings on either side act as horizontal rudders and a large star shaped vertical rudder is placed in the rear.

MALECOT AIRSHIP—AEROPLANE.

The second week in September a new French combination attempted its initial flight at Meaux. Below the 108-foot, diameter 24 foot, gas bag is a longitudinal plane, 66 feet long having 1938 square feet of surface. The bag is held in shape by means of balloonettes inflated with a fan. A Buchet motor drives a single propeller 10.49 feet in diameter. Beneath the openwork girder which supports this large plane is the cage for the engine and below this the basket for the passengers. The basket is slung to the framework by a rope and is apparently intended as a balance weight, for when starting it is shifted to the rear to tilt the nose up and vice versa. The framework is attached to the bag by the side suspension system.



The Car.

During the week ending September 14 it was brought out for trial but as the ship rose the cable carrying the basket fouled and some little damage was done.

THE NEW VUIA AEROPLANE.

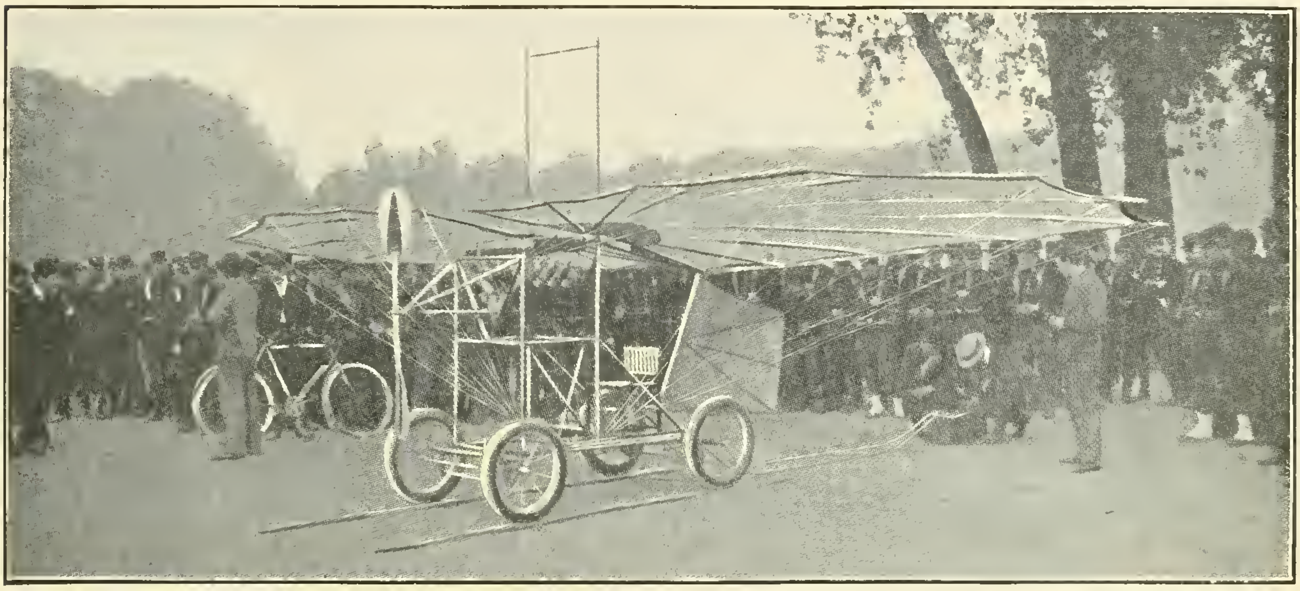
The new Vuia machine had its first try-out on June 3 for the purpose of testing its motor. It is practically the old one remodelled, lightened and provided with a new 8-cylinder 24-h. p. Antoinette motor.

The machine is constructed of steel tubing and slung on axles, the one in front being fitted with steering knuckles and the rear axle dead. The axles are trussed and the frame underslung on heavy coiled helical springs. As in the former machine, the propellér is in front and the two rudders at the back. The driver is seated under the motor in the center of the framework and steers with a wheel. The motor is water cooled with automatic intake and exhaust valves. The cooling is by the thermo-siphon system and ignition by high tension jump spark, the accumulator being carried underneath the seat. The propeller is direct driven and the shaft is on ball bearings. Splash lubrication is used.

The spread of the carrying surface is 7.9 metres (25.9 ft.) and the length 7 metres (23 ft.). The shape of the surface is the same as in the former machine. The height of the parabolic curve of this surface has been cut down from a 24th to a 30th of the width of the surface. The curve is maintained in the length as well as in the width. The center of gravity is very low, maintaining the general good stability in former trials. To aid in this and to give greater safety the length of the sustaining surface lessens towards the extremities. The center of pressure has been found to be two-fifths of the distance from the front of the machine. The axis of the screw does not pass through the center of gravity.

The sustaining surface is in two parts that can be closed. Eleven steel tubes spread the canvas wings and are stayed with light piano wire attached at the top to a central arc and at the bottom to the frame of the machine. The two vertical axes are maintained rigid by steel guy wires. The wires are fitted with turnbuckles. The surface of the vertical rudder has been doubled and the horizontal rudder placed further from the center of the machine. Between the rudders and the sustaining surface is a horizontal surface of 2 square meters for automatic longitudinal stability. The horizontal rudder is only used to correct longitudinal instability produced by the increase or decrease of speed as the result of the displacement of the center of pressure.

The comparative smallness of the supporting surface has the advantage that it will resist greater winds and in case of stoppage of the engine the speed reduces



THE NEW VUIA AEROPLANE.

less rapidly. "Lilienthal with a plane of 14 square meters (150.7 sq. ft.) and a weight of 95 kilos (198.4 lbs.) maintained himself in perfect equilibrium in winds which varied from 6 to 10 meters (19.68 to 32.80 ft.) per second. If Lilienthal carried with his plane nearly 7 kilos (15.4 lbs.) per square meter at a speed of 8 meters (26.24 ft.) per second, one can make a motor aeroplane carry 14 to 16 kilos per square meter (10.76 sq. ft.) at a speed of 12 meters (39.36 ft.) per second."

JAPAN AND AMERICA.

By Rudolph Martin.

Author of "Berlin—Bagdad."

Through the progress of the motor airship the power of Great Britain is decreased. The power of Japan however increases as the motor airship progresses. On the neighboring continent to Great Britain there live powerful nations of great wealth and of the highest intelligence in the problem of aerial navigation. On the Eastern Asiatic Continent neighboring Japan there are no large nations of equal wealth and industry who realize the importance of aerial navigation. The Russians would no more use the airship in battle than they at one time would use the battleship. No more would the Chinese be likely within the next decade to land armies on the territory of Japan by means of airships. The great expanse of China and Siberia would be easy to the Japanese plan of conquest. Also the most remote cor-

ners of the Chinese Empire could easily be reached by Japan's fleets of airships. Not only in war but also in peace the fleets of England, Germany and France have forced a more advantageous handling of their merchandise as well as the merchandise of other nations. If the fleets of airships of Japan navigated all over China every Chinaman would be bound to respect the power of Japan. The trade with China of the Americans, English and Germans would be in danger of decreasing. The sea power of the far away nations would be far behind the power Japan would have in the air, being so close by. The Japanese would no more need the approval of England through a conference. Japan appreciates to the fullest extent the superiority of her position. The strength of the Japanese fleet cannot be lessened by the hostile fleets of airships of neighboring powers. The strength of Japan does not depend, like the strength of England, on her sea forces. Japan is the only island which can put forth quickly a strong standing army. While the need of a large standing army is felt more by Great Britain as the certainty of the motor airship becomes felt, so the Japanese experience more joy at their large standing army. The motor airship shows them the possibility of putting their army any place in Siberia or China by the shortest possible route and with the greatest speed. The future mobilisation of Japan will be far more rapid than it was in 1904. With their land, sea, and air powers, the Japanese are also in position to lay claim to the Philippines and to place their flag over them. Only through co-operation with Germany, England and France will it be possible for the United States to insure their continued ownership in the Philippines.

Up to the present time there has always existed the possibility that Japan or an European power could blockade the ports of the United States or even land troops. As soon as the United States are in possession of a powerful fleet of airships, the war fleets of the foreign nations would be at a great disadvantage. The airships could clearly have within view a distance of from 200 to 400 miles out to sea. Only, the airships could not go too far from the shore or too far from their supply of gasoline. It is positive that the United States will increase their power on the American continent as the motor airship develops. Up to the present time they have kept out of the conflicts in South and Central America so as to avoid becoming mixed up in an international war. In the future the United States will not only be superior at sea but also on the land. The wealthy, industrious, and sporting United States can in the future carry on a war in the interior of South America solely from the air. The maintaining of a large fleet of airships by the United States is the same as the maintaining of a large standing army. The compulsion of all to serve in a large standing army is not according to the American ideas. As the United States are not neighbors to a powerful nation having a large standing army and appreciating the benefits of airships they have no occasion, like England, to fear a hostile army. The superiority of the American fleet will not, so long as it keeps to the coasts of South and North America become endangered by hostile fleets of air ships. Without extraordinary effort and without urging, the United States will adopt motor airships as a power.

Only with much toil and perhaps not without a struggle Japan will develop the motor airship which offers her such an opportunity. The motor in the air threatens particularly Germany, whose people, however, are far advanced in the knowledge of aerial navigation. But the motor in the air offers Germany, also, a possibility of overcoming the danger, namely, by leading all other nations in the problem of aerial navigation. This offers Germany the greatest opportunity in the history of the World.—*From "Das Zeitalter der Motorluftschiffahrt."*

CHRONOLOGY OF PRINCIPAL EVENTS.

Sept. 2. Walter Wellman starts for the Pole in the airship "America." The balloon was towed three miles by the steamer "Express" and then let loose over the Polar Sea. The speed attained estimated about twelve miles an hour. A snow-

storm was encountered, the compass failed to work and after three and one quarter hours, covering fifteen miles, it was decided to land. On account of the lateness of the season the attempt has been postponed another year (?).

Sept. 7. Bleriot makes three trials this week at Issy with little success, despite the new 50-h. p. motor.

Sept. 9. Ludlow's kite makes an unsuccessful flight over Hampton Roads, Va., towed by U. S. Torpedo Boat "Gwin."

Sept. 10. The British military airship makes its appearance at Farnborough. Although a slight mishap to the driving belt cut short the initial flight the ship achieved somewhat of success. In all, three separate tests were made and the various evolutions were, considering conditions, satisfactorily performed.

Sept. 12. The Ville de Paris, the rival of the Patrie in speed, security and manageability, maneouvres over Paris. The former can carry more weight than Patrie and makes a speed of 25 miles an hour.

Sept. 14. The Parseval dirigible carries up the Minister of War and other officers at Tegel. About twelve trips made in one day. Ascents have been made almost daily of late.

Sept. 15. International Balloon Race at Brussels won by Oscar Erbsloh, one of the German contestants in the Gordon Bennett race at St. Louis. Distance traveled 603 miles. Twenty-two balloons started.

Sept. 17. Bleriot makes a flight of about 587 feet, when the motor suddenly stopped. The machine was dashed to the ground and badly damaged, M. Bleriot being injured about the head. In the start the motor ran along the ground for 90 feet, rose to a height of 40 feet and proceeded at an estimated speed of 40 miles.

Sept. 21. Louis Malecot makes first actual trip in dirigible balloon-aeroplane.

Henry Deutsch, owner of Ville de Paris journeys in it to a shooting party at his Gaillon estate, alights easily, and joins his friends. The "chauffeur" takes it back to the "garage."

Sept. 23. Malecot makes another ascent but a high wind damaged the ship to such an extent that no further trials can be made with it this year.

Sept. 24. Zeppelin makes a flight lasting four hours and seventeen minutes over Lake Constance and five different states. With both motors in operation it outdistanced the numerous steamers on the lake. The speed estimate was thirty-eight miles an hour. With the Count there were nine men.

Sept. 26—28. Count Zeppelin continues experimental flights, witnessed by Prof. Hergesell and Major von Kepler. The Government has appropriated $40,000 to aid in these experiments, and it is reported that the Government has taken the outfit. On the 28th the propeller broke. Aeronauts rescued by boats and ship towed to shed by steamer.

Sept. 27. U. S. Government announces its intention of building a dirigible.

Sept. 29. Nineteen balloons start in the Grand Prix race of the French club.

Heavy fog and rain; won by M. De Lobel; landing made in the North Sea; Aeronauts rescued by steamer; after floating an hour and ten minutes.

Sept. 30. Zeppelin makes a flight of seven hours. During that time a landing was made to take on board a representative of the Ministry of war.

New English dirigible makes second and a successful flight. Travelled sixteen miles and attained a speed of twelve miles an hour against the wind. Time in air, free, fifty-seven minutes.

AERONAUTICS IN THE CURRENT MAGAZINES.

Cosmopolitan for October. "The Problem of Air Flight," by Waldemar Kaempffert. This interestingly written article is a resume of the accomplishments in aerial locomotion to date, both in aerostation and aviation. Not counting one or two rather important omissions the article is a most instructive one to the general public.

American Magazine for October. Our genial club man, E. B. Bronson, has written an exciting account of the now famous trip of the Donaldson balloon of '74. Of the participants in this memorable excursion Mr. Bronson is the sole survivor. He relates some stirring incidents and one will greatly enjoy reading of his "aerial bivouac."

McClure's for October. Cleveland Moffett tells the story of last year's Gordon Bennett and the memorable trip of Lieutenant Lahm and Major Hersey, a tale which bears re-telling very well.

Recreation for October. Alan R. Hawley has written the "Observations of an Amateur Aeronaut," in which he tells of the joys of trips in the clouds, the cost of ballooning, etc. Mr. Hawley is evidently trying to do missionary work and we wish him good success.

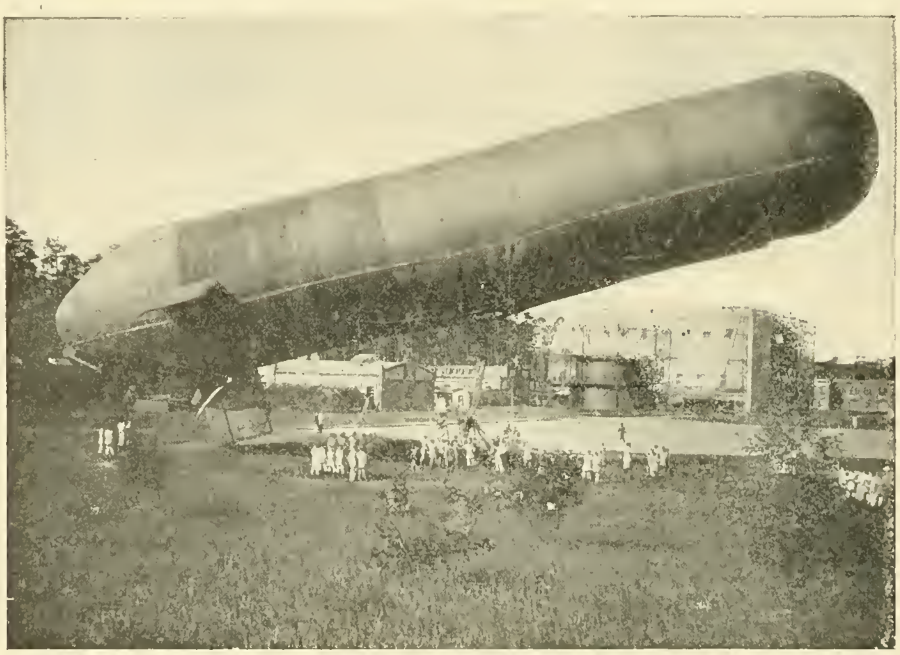
The Strand for October contains an article by Captain Homer W. Hedge, the founder and first president of the Aero Club of America. In this he mentions the best-known airship and balloon flights which have been made since the starting of the Club, touches lightly upon recent events and speaks of the coming race.

Outing for October contains the story of last year's Gordon Bennett written by Lieutenant Lahm himself.

THE NEW PARSEVAL.

The recent successful flights of the new German dirigible balloon has caused excitable Teutonic enthusiasts to start writing all sorts of stories of the possibilities of the annihilation by The Fatherland of the other European nations. In spite of all these prophesies one can with difficulty believe that a motor driven gas bag will ever be a feature of the wars of the future.

The peculiarity of this balloon is its propeller. Instead of solid blades, there are four strips of fabric with weights at the end, held rigid, when in motion, by centrifugal force. At rest they hang down. This is not exactly an innovation, although it is new in practice. A Mr. Hollander, of New York, has had this plan embodied in a propeller for several years. In his device the blades are coiled up inside a cylinder when at rest, the centrifugal force gradually pulling them out through slits against the pull of a spring.



THE 1906 PARSEVAL.

Major Parseval states that more powerful motors are necessary to drive against a fairly strong wind. In this new model the extremities have been made more pointed.

THE HISTORY OF AIRSHIPS.

By Aeronatus

The first attempt at a dirigible balloon was in 1784 when the Duke of Chartres had built an egg-shaped envelope, propelled by oars. Some little result was obtained. In 1834, 1848, 1870, 1879 and 1882 other crude attempts were made, mostly without result.

In 1852 Henry Giffard devised an airship of a spindle shape and this form has been quite closely followed ever since. A steam engine drove a screw propeller. After this came many designs on paper only.

In 1872 Paul Haenlein's dirigible with a gas engine definitely proved its navigability. An electrically driven airship was produced in 1883 as a result of the recommendation, in 1881, of Albert and Gaston Tissandier.

From 1884 to 1885 Renard and Krebs experimented with "La France," using a 9-h.p. electric motor with screw propeller and obtained very good results.

Dr. Woelfert, in 1896, built a cigar-shaped dirigible and used a benzine engine. This was unsatisfactory and in the operation of an improvement to the engine the ship caught fire and was destroyed. Aluminum screw propeller.

Between 1895 and 1897 David Schwartz constructed a rigid aluminum airship, with a 12-h.p. benzine motor operating a screw propeller. A flight was accomplished and a safe landing made but the ship

STEVENS AT BRIGHTON BEACH.

was not able to proceed against the wind. After being deflated the pressure of the wind together with the vandalism of the spectators wrecked the ship. From this time on screw propellers continued in use.

Up to this time the laws relating to air resistance were not sufficiently understood, the motive power under estimated and the action of the screw propeller little known.

In 1898 Santos Dumont made his first flight and in 1902 succeeded in sailing around the Eiffel Tower and back to the start at St. Cloud in 30 minutes, winning the Deutsch prize of $20,000. Up to 1905 Santos Dumont had built fourteen different airships and this number has since grown to sixteen.

At the same period the Graf F. von Zeppelin made some phenomenal flights over Lake Constance in 1900, in the Spring of which year was announced the offer of M. Deutsch of 100,000 francs to the first dirigible to rise from the park at St. Cloud and describe a closed arc in such a way that the axis of the Eiffel Tower should be within the interior of the circuit and return in half an hour. That Zeppelin had no small ideas is evidenced by his ship, 420 feet long. It had the form of a prism of 24 surfaces, carried two cars, each containing a 16 h.p. benzine motor. In constructing this ship he had little to go by as previous ships had all been comparatively small. In 1905 his ship was rebuilt and equipped with two 80 h.p. motors.

In 1902 Augusto Severo made an ascent with a 98-foot ship, equipped with two Buchet motors, one of 12 h.p. and the other of 24 h.p. Fourteen minutes after ascending the balloon exploded.

Baron Bradsky-Laboun, in 1902, made some experiments with a 71-foot airship but came to grief.

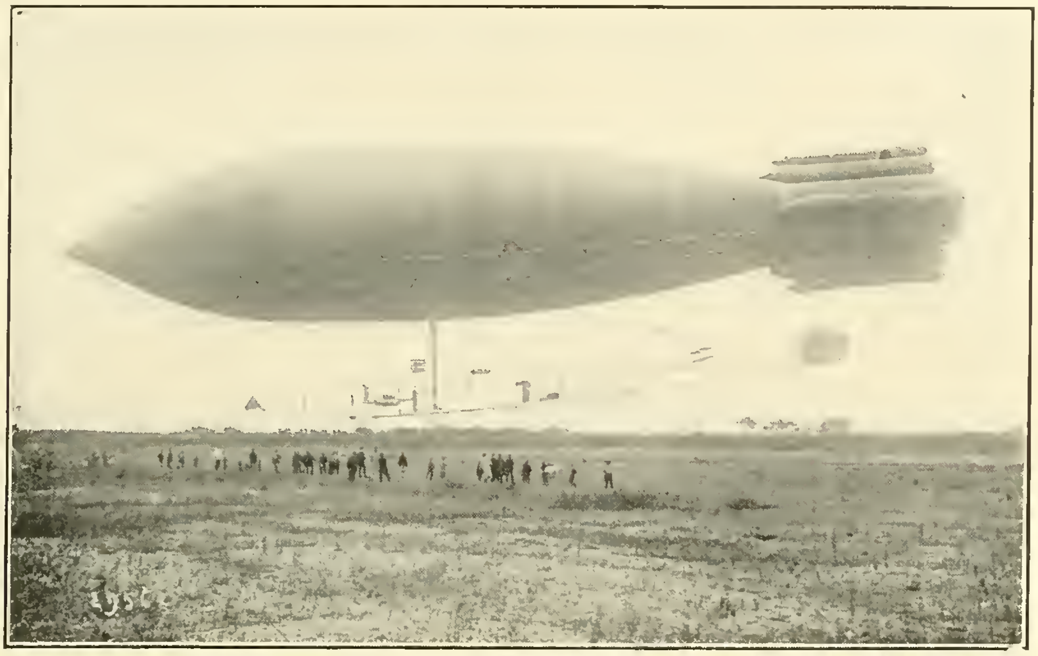
In 1902 appeared, also, the famous English dirigible of Stanley Spencer, who navigated his airship from the Crystal Palace, London, to Harrow. In September of the same year he attempted to sail from the Crystal Palace around the tower of St. Paul's Cathedral and back to Sydenham. He sailed over and partly around St. Paul's, but did not find it possible to get back to Sydenham. After describing a semi-circle about the cathedral he sailed away to his establishment at Highbury where he executed several maneouvres to the astonishment of his workmen. From there on to Alexandra Palace where he made more evolutions, finally descending at New Barnet, a distance of 17 miles from Crystal Palace. He was an hour and a half in the air.

In France at the same time appeared the Lebaudy ship. From October 25, 1902, to November 21, 1903, it made thirty-three ascents. An accident on landing destroyed the envelope and in 1904 a new one was built. From 1904 to 1905 thirty ascents were made with this, but this one likewise was torn to pieces on landing. In 1905 appeared the third Lebaudy ship, "La Patrie," whose accomplishments are known to all the world. In 1906 this was sold to the French Government. With this ship have been made the greatest successes in airship history, although Germany now claims to have its equal in the "Parseval," and the new English airship has shown up well in the first trials. Then there is Deutsch's "Ville de Paris" which has this Fall been making good flights.

In America many small dirigibles have been built, A. Leo Stevens designing the first, and all have been successful to a remarkable extent, when the general low power is taken into consideration. It is to be regretted that no one has undertaken the building of a high-powered ship, though Captain Thomas S. Baldwin has this year introduced a higher powered motor and twin propellers. The results have been most favorable. The pioneers have been A. Leo Stevens, Capt. Baldwin and Carl E. Myers.

To Santos Dumont actually belongs the credit for introducing the dirigible

into active use. Although his ships have been made in France, one can hardly say that to France belongs the honors. All the credit is due France for the later Lebaudy, but it will be hard upward climb for her if she expects to retain her apparent present lead.



(N. E. Automobile Journal) LA VILLE DE PARIS.

AERONAUTICAL MOTORS.

It is intended to publish in each number a description of the various light motors now on the market which are adapted for use in dirigible balloons and heavier-than-air machines.

Antoinette.

We have been repeatedly asked for a description of this motor and below we have attempted to give the principal points.

Constructed on the "V" principle, the cylinders being at an angle of 90° with each other and 45° from the vertical. The number of the cylinders can be varied from 8 to 24.

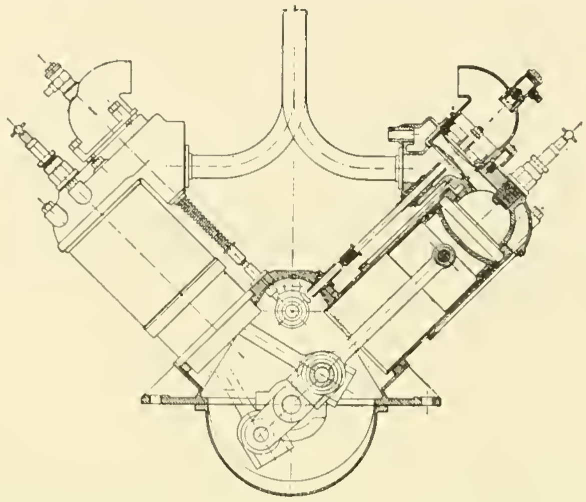
Each crank in the crankshaft carries two connecting rods. In this way the number of bearings in the cylinder is the same as in the ordinary type of engine with half the number of cylinders. In other words, the number of bearings on the crankshaft is reduced one half by this construction.

The engine is reversible by the simple operation of rotating a small wheel on the end of the cam shaft. Thus it may be reversed easier than a steam engine. This reversal is effected by changing the relation of the cams with the position of the piston in the stroke, similarly to the Stephenson link motion in the Steam Engine. One of the 2 to 1 cam shaft pinions is made loose on its shaft which it drives by means of a small clutch mechanism, the position of which can be varied through 90°. This mechanism consists of a loose pin fitted into a corresponding hold in the cam shaft spur wheel. This pin can be pulled outwards by means of a knob and rotated through 90° when it falls into another corresponding hole. The ignition timing is not upset by this operation, as the ignition plate is driven directly off a spur wheel meshing with the 2 to 1 wheel in the cam shaft.

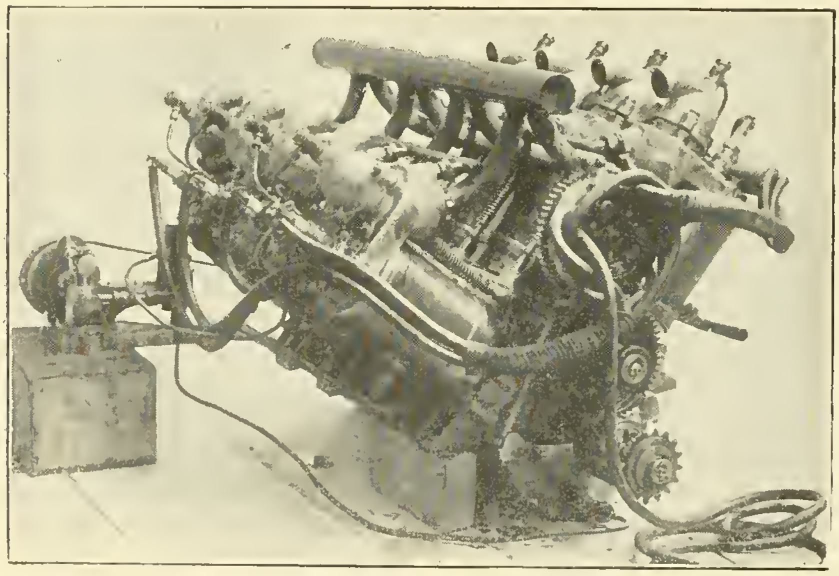
The ignition is by special high tension coil with a single trembler. Regularity of timing is thereby effected, and there are no troubles due to lack of synchronization.

The contact maker has internal contacts, and is extremely robust.

The carburation is on the principle of introducing liquid petrol directly into the cylinder through an automatic inlet valve. Each cylinder is fitted with its own carbureter or petrol injector and are all connected to a common petrol supply circuit, fed by a small petrol pressure pump driven from the main shaft of the



engine. The amount of pressure on the whole petrol system can be varied at will by means of an eccentric on the pump. In this way each carbureter receives its pre-determined and all the same quota of petrol, thereby producing the extreme regularity of running for which this engine is noted. The air necessary for the carburation is taken in through the bell mouth on the top of each cylinder. By this system all large air inlet pipes with sharp corners and bends, and carbureters liable to disarrangement are eliminated. Each cylinder receives its exact quantity of fuel at the time when it is required and without any reference to the action of any other cylinder. There are, consequently, no back pressures in pipes and no starving of one cylinder by the suction of another, and the weight of all parts is reduced to a minimum.



Another fundamental principle which has been followed in this engine is the reduction of piston speed in feet per minute to a minimum. The cylinders are all short stroke, thereby permitting high rotative speeds.

The oiling is by one forced feed oil pump, which is integral with the petrol pump, and the speed of which varies with the speed of the engine. There are only two pipes leading away from this pump, and these lubricate all the bearings of the engine and other parts requiring lubrication. The inlet valves are automatic. The exhaust valves are mechanically operated all off one cam shaft.

Constructional Points.

Cylinders.—High tensile cast aluminum-alloy heads securely bolted to cast iron cylinder with a brass water jacket spun on. These cast heads are a special feature of the engine, reducing its weight considerably and forming a combustion chamber of wonderful heat conductivity, the specific conductivity of aluminum

being about the same as that of silver; the cooling water is able to take away the heat units generated by the explosions much more rapidly than in the case of a cast iron combustion chamber. The cylinder is cast iron turned all over, thereby ensuring equal expansion. Crank case, aluminum casting. Connecting rods, cam shaft, valves, valve seatings, all special high tensile alloy steel. Pistons, cast iron each with 3 rings and concave top. Absence of vibration owing to the large number of impulses per revolution.

NOTES.

G. H. Curtiss has been with Doctor Bell at his laboratory at Beinn Bhreagh the greater part of September.

It is said the Ville de Paris, the privately owned dirigible of Henry Deutsche, has cost him $400,000.

The brothers Wright went to Berlin on September 16th and were "sympathetically received," it is said.

La Patrie is out of commission temporarily in order to lengthen and strengthen the frame.

Walter Wellman seems to be convinced that he can reach the Pole with his airship "America." On arriving at Tronhjem he stated, "our confidence in our ultimate success, given an average Summer, is unchanged."

A professional aeronaut descended in a parachute at Warsaw, landing near the Warsaw barracks. He was promptly arrested as a suspicious character. Let us hope this doesn't happen to our foreign competitors in the St. Louis race.

A. Leo Stevens has charge of the instruction of the U. S. Army Balloon Corps, which has recently been augmented, and is now in Washington engaged in the active schooling of the men.

On August 31st Dr. Alexander Graham Bell entertained his friends at Beinn Bhreagh on the occasion of the completion of an outlook tower, "the first iron structure built of tetrahedral cells."

It is certainly gratifying to know that America will have *one* balloon of home manufacture in the Gordon Bennett. A. Leo Stevens is working hard on a new "America" for J. C. McCoy.

The Ville de Paris is again in the air, after being in the hospital as a result of its buckling some months ago. Its first flight after repairs was most satisfactory. The length is 203 feet, greatest diameter 34 feet. A 70-h. p. Argus motor drives a Renard propeller.

E. A. Gathmann, of Bethlehem, Pa., has been experimenting for a long time and has devised a new propeller which, he states, gives an actual lifting efficiency of 85 lbs. per h. p., a 6-h. p. gasoline motor giving a measured thrust on the scale of 510 lbs. A "heliconef" will be built to employ this form of propeller.

The balloon which Messrs. Brewer and Brabazon will use in the Gordon Bennett is "The Two Americas" used by Santos-Dumont in last year's Gordon Bennett as one of our representatives, when it was fitted with a motor and propellers for regulating the altitude. It has been revarnished and rechristened the "Lotus II."

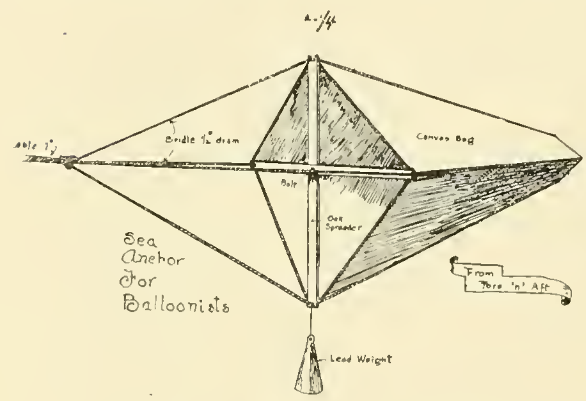
The balloon detachment of the Signal Corps, consisting of ten men, is stationed at Washington Barracks, D. C. and is receiving practical instruction in the preparation and filling of balloons, repairing, etc., under the direction of A. Leo Stevens. Two ascensions were made during September by Captain Chas. De Forrest Chandler and J. C. McCoy.

The Lebaudy people have cancelled their contracts to build dirigibles for other countries than France, as a result, evidently, of having made some sort of agreement with the French Government. A well-known German rubber concern had a selling arrangement with them for the sale of their airships in Germany and America but this has now been cancelled.

Cortlandt Field Bishop sails for America October 2 on the Princessin Cecilie; Frank S. Lahm and the French team, September 28 on La Provence; Griffith Brewer and Lieut. the Hon. Claud Brabazon, October 5, on the Lusitania.

In stating the distance traveled by the new Ben Franklin Association balloon on its first trip in the September number we were misinformed as to the distance traveled. The landing was made at New Egypt, N. J., a distance of 37 miles from the start—not 160 miles.

The long distance record with England as a starting point was held by Charles Green, Robert Holland and Monck Mason from November, 1836, until November, 1906, when A. Leslie Bucknall and Percival Spencer traveled from London to Nevy, Lake of Geneva, 402.5 miles. The former party landed at Weilburg, in Nassau, Germany, a distance of 372.5 miles.



A good suggestion for the balloonist in the vicinity of open water was made in *Fore'n' Aft* some time ago. In place of the usual cone-shaped bag attached to a ring the writer suggests a square, cone-shaped funnel as shown in the sketch, as it will fold up more completely.

Motor Print, a magazine supposedly devoted to automobilism, has for a long time gone considerably out of its way to viciously attack the doings and anticipations of the Aero Club of America, and some of its members individually. There is no reason that we know of why *Motor Print* should see fit to do this but as most of the statements and characterizations are obviously untrue no great harm will accrue to any except *Motor Print.* It is published in Philadelphia!

A fifty-five-foot dirigible has been completed by George Yager, Charles and Otto Bayersdorfer, of Omaha, Neb. The frame is the same length as the envelope. The capacity is 8000 cubic feet, with a lifting capacity of 480 pounds. The propeller is hung on a ball and socket joint and does the steering as well as pulling, no rudder—so called—being used. The 7-h. p. gasoline engine weighs 50 pounds and the frame 47 pounds. Its first four flights have been successful.

The floating balloon shed of the Graf. F. von Zeppelin on Lake Constance, was finished the middle of September. This was damaged by storm some time ago. Further trials are being made with the present ship. It is reported that another ship, considerably larger than the present model, is soon to be under way. Several new designs will be tried out, the principal improvement being in the steering apparatus. It is also intended to install a wireless apparatus and a searchlight.

Experiments at Issy during September with a helicopter devised by Messrs.

Breguet and Richter. Apparatus consists of four propellers in a nearly horizontal plane driven by 40-h. p. engine and as the framework was incomplete an armchair was used for purposes of trial. Although weighing about half a ton it is stated that the machine lifted itself and the aeronaut into the air—"four men being required to hold it down.

We are informed by a letter from W. S. Haskell, of West Berkeley, Cal., that a "National Airship Company," of San Francisco, has in course of construction a dirigible. He says: "The ship is nearly completed. I was at the yards this afternoon (Sept. 6) and found a large cigar-shaped canvas more than six hundred feet in length being filled with air for the purpose—one of the workmen said—of doing some work on the inside. The inventor himself was only visible by his voice which sounded from the hollow depths warning me that it was his busy day and that he had no time to talk. He is very zealous in his undertaking and seems confident of success. There were something like eight men at work on the visible side of the ship and probably as many more on the inside of the canvas. It looked as though they would be able to make a trial trip within a week or two, but, of course, there is much work to perform on so large a structure. The silk is strong and well corded and cross-stitched so that there is no danger of ripping. The bag was held down by weights while the motor pumped air into it."

It is to be regretted that there are so many fantastic ideas for the solving of aerial locomotion, ideas which are preposterous at the very outset and obvious to even the veriest novice. Those responsible seem never to tire of exploiting them—on paper. No business man with money is going to invest in the building of a machine until some preliminary work has been done to bear out in some degree the statements of the inventor. One man, for instance, has been seven years trying to sell an idea for a bird-wing machine, giving his whole time and living upon his children. No model has ever been made and he refuses to make one. He says the drawing proves everything. Such stubbornness would be ludicrous were it not for the fact that the man has wasted so much valuable time and energy which should have been directed along proper lines. They "are not all dead yet."

A new long-distance record to be attempted. J. L. Tannar, A. E. Gaudron and Charles C. Turner, a representative of the *London Daily Graphic*, are planning to break the world's long-distance balloon record. Mr. Tannar's giant balloon will be employed and most minute arrangements are being perfected.

A sea anchor will hang below the car and on each side are air-tight cylindrical floats to keep the car afloat if landing is made in the water. A few feet above the car is a platform supporting a canvas enclosed apartment which is reached by a rope ladder. The neck of the balloon can thus be reached from the platform and the food and drink will be kept there. Projecting from the side of the car is a writing tablet and a small electric lamp is suspended from a nearby rope. On the outside of one corner of the car is a "ballast thrower." A lever on a level with the top of the basket simplifies the discharging of ballast and saves considerable labor. An electric bell will ring the instant the drag rope touches the ground. The barometer even will give audible signals of ascent or descent from certain predetermined levels. Carrier pigeons will be carried and released at intervals.

Berlin, Sept. 14.—Walter Wellman has sent the following cablegram to the *Lokal Anzeiger* from Tromsoe:

"After the steamer Express cast off the cable, the balloon America did excellently, but an increasing wind soon gave us a hard struggle, and the storm drove us toward some high, jagged mountains near the coast, where the airship would have been destroyed if she struck.

"There then ensued a hard fight between the storm and the motor. The latter triumphed, and we slowly rounded the north end of Foul Island in the teeth of the wind. Our confidence in the America had so increased in the meanwhile that I gave the order to start for the north pole.

"The wind, however, increased to twelve miles an hour, and the snow fell so thickly that we could not see a quarter of a mile. Just then the compass failed to act owing to defective construction. We were completely lost in a snow storm above the Polar Sea and threatened with destruction. After a brief deliberation we decided to try and get back to the Express to rectify our compass and start again.

"It was impossible, however, to keep in one direction, and we were again carried into dangerous proximity to the mountains. Vaniman, the engineer, then started the motor at top speed, and the America moved a second time against the wind, which probably was blowing fifteen miles an hour.

"She circled three times in the teeth of the wind. We saw the Express for a moment, but immediately lost her again. We would have returned to the Express if we could have seen where to steer, but under the circumstances the only thing possible was to try to land. With this idea we stopped the motor and let the America drift over the glacier.

"At the end of Foul Bay we used a trailer filled with provisions and a brake rope. Both acted well and dragged over an ice wall 100 feet high without damaging the provisions.

"After crossing the glacier we opened the valve, and landed on the upper glacier, half a mile inshore. The landing was effected so successfully that material weighing nine tons descended three hundred feet and touched the ice with no shock or damage whatever excepting several bent tubes and broken wires. The numerous delicate instruments were not injured: The self-registering barographs, meterographs, and manometers continued running after the landing. The mantle of the balloon can easily be repaired.

"The America was in the air for three hours and fifteen minutes, and covered about fifteen miles with her own machinery. She made three loops against the wind, proving her power and capability of being steered. The ascent was successful in every respect. The America is from every standpoint the strongest airship and the most durable for a long journey that ever has been built. She held the gas splendidly.

"Later in the same day the Express found us, and fetched the steamer Frithjoff with men and sledges from the camp. The crew of the America lived for three days comfortably in the gondola while the work of rescuing the balloon was in progress. They could have lived there for nine months had it been necessary. The entire airship, including even a part of the gasoline, was returned to the camp in three days.

"The balloon and the entire outfit have been made ready for the Winter, and three men have been left on guard.

"After this successful attempt we were all convinced that the America, in normal summer weather, can make her way to the pole. We all regard this plan as rational, practicable, and feasible. The thing can be done, and what can be done shall be done."

COMMUNICATIONS.

Aeronautic Motors.

To the Editor,

American Magazine of Aeronautics.

Dear Sir:

In reply to Mr. Roger B. Whitman's criticism of my article on light engines, will say, that, like Mr. Whitman, my experience in gasoline engine design has been limited thus far to automobile work, in which I have had about a dozen years' experience as a designer with several prominent companies. I have had, however, some views upon the subject of designing that I consider a little in advance of present practice, and this small compression space plan is one of them. An engineer that would design a steam engine to take steam the full length of stroke, except for some special purpose, perhaps, would be laughed at; and yet, that engine would give much more power than one with a cut-off. Why should a gasoline engine designer, then, do with his engine just what he would laugh at the steam man for doing? For when he squeezes in all the mixture that he possibly can, and consequently has to exhaust with sixty pounds or more pressure, he is certainly doing the same thing.

Automatic valves are a nuisance when applied to the ordinary engine, but when supplied with a strong spring and given a flat seat, using a small compression space engine, they are perfectly reliable. What little stick there is then is so small in comparison with the strength of the spring that it is negligible. The suction, of course, being very much stronger with the small space mentioned, as the vacuum is then more perfect.

A higher compression may be used with this plan, as the above normal pressure is reached so late in the stroke that the piston is ready to pass over the center, so that by the time the explosion takes place the piston is over the center; and I believe that it is generally conceded that the quicker the inflamation can be made to take place the more satisfactory the explosion, that is, as applied to gasoline, some even going so far as to ignite in two or more places at once.

The small four cylinder engine that I exhibited at the Aero Club Show last year has a compression space of only fifteen per cent. of the total space, and I have had excellent results from it at ninety pounds compression. At a higher pressure it will run along at a good gait with the ignition current cut off. There is no hammering, however, due to premature firing. Before building this engine I had an article in the Horseless Age expressing my views upon this subject, which was later criticised by a correspondent who predicted all kinds of dire results if the spring ever weakened, or broke. It would certainly wreck the engine. I stuck to my theory, however, tried the engine out with all kind of springs, from the very weakest up to fourteen pounds, the latter was the strongest that the one and a quarter inch valve would suck down, the result is that I would take a step farther and adopt a twelve and a half per cent. compression space for my next engine.

On account of being able to use a higher compression the cylinders will not have to be made very much larger than in present methods, while the rest of the engine would be just the same, as these parts are designed for horse-power, and not according to size of cylinders.

As to the springs of an automatic inlet valve getting excessively hot, there is no need of this occurring, as they are placed right in the path of the excessively cold incoming charge, and, contrary to Mr. Whitman's statement, they can be placed outside if desired, the stem passing through the casing.

I do not claim that the long stroke will lighten an engine. In my early days I approved of the short stroke. That was some years ago. In the engine in view in my article, I was not sacrificing every thing for lightness.

The Panhard company have been using steel for the cylinders of their racing

cars for several years past. I have not heard of them giving them up yet. My own personal experience in that line has given very satisfactory results.

I cannot agree with Mr. Whitman in his statement that the function of a carbureter is not to mix the charge. If that were the case, one form of nozzle would be just as good as any other, while we all know that a wide range of results is obtained from different types of nozzles; also that wire gauze inserted in the piping will often greatly improve the action, due to the stirring up effect received thereby.

HARRY E. DEY.

AN APPRECIATION.

To the Editor,
American Magazine of Aeronautics.

Dear Sir:

Several weeks ago I received the first number of the American Magazine of Aeronautics. I was very much pleased to know that the United States have at last an Aeronautical Journal. This country has a tremendous number of inventors; the special journal describing different discoveries and inventions of other countries or of other inventors prevents loss of their precious time and mental forces of great ability in investigating and discovering of the things which were investigated and discovered a hundred years ago.

The Aeronautical Journal, besides its great use as a recorder of all events, successes, failures of past time and so on, provides a wide field for discussion of various topics of the broad problem—the creation of the aerial craft and application in practical life for transportation of passengers with safety and necessary speed. This great purpose can be reached by the combined efforts of several faculties of the brains, such as great scientific knowledge, technical experience, extreme courage, perseverance, perfect physical development, sound judgment, good business and organizing abilities. In short—you cannot find now these qualities in a single individual, although you can meet lots of men thinking or claiming they are such men and that they soon will show to the whole world the decision of the problem. Ninety per cent. of them are either ignorant maniacs, believing that only shortage in money hinders them, or swindlers, looking upon air-navigation as a way to get money for their selfish sakes.

For the sound and honest people really interested in rapid solution of the problem there are two ways now: First, to wait until Nature presents to us such a wonderful individual as prescribed above; second, to combine our faculties and forces altogether to work honestly, helping each other and protecting the product of the work of honest inventors from theft by fraudulent or dishonest people.

What can hinder us from success in the second case? First, the false, exaggerated ambition of inventors; second, the selfish desire "to make money" by invention "in secret." The false ambition, as I noticed in my large personal acquaintance with a great many of inventors, belongs mostly to very average men, and they are exceedingly jealous of the success of others. Their envy makes them always want to lower and to dishonor the men of real ability and knowledge. The best medicine for them is sound judgment and open discussions about their "inventions." The selfish secretness is not very dangerous, it shows only that one is inclined to appropriate the work of others, whose articles he reads or the results of their experiments he applies, and does not wish to repay for the things he has gotten. They are not so hopeless as the first class and can be put on the right way by punishment of the public opinion of their fellow specialists.

Ending this letter I would like to remind my fellow aeronauts of the opportunities to be derived from the existence of the American Magazine of Aeronautics: (1) The acquaintance of all Americans interested in Aeronautics; (2)

the possibility of being in touch with all progress made by aeronauts of the whole world in practice and theory; (3) the creation of professional morality, which will give good assistance to the promotion of aeri-navigation by helping honest inventors and persecuting the swindlers; (4) the best intermediary between the inventor, workman and purchaser. And thus, everyone who is interested in aeronautics ought to help Mr. Jones in his hard work as an editor and publisher of such a special journal.

Yours very truly,
(Signed) F. A. POSTNIKOV,
Lt.-Col., Military and Civil Egr.,
Aeronautic Grad.

The Longest Balloon Voyage.

To the Editor of the American Journal of Aeronautics:

It is stated in your first number, page 30, that John Wise traveled, in 1859, from St. Louis to Henderson, New York, a distance of 1150 miles, in about 19 hours, and this statement is frequently quoted as an American record for distance, which practically equals the world's record of 1193 miles, made by Count de La Vaulx, in 1900.

In view of the international race for the longest distance, soon to start from St. Louis, it seems desirable to explain that although Professor Wise may have traveled the distance stated, the length of a balloon voyage is always reckoned as the shortest distance between the starting and landing points, and for Wise's voyage I find this to be about 870 miles. This distance has been exceeded several times in Europe, and the time which Wise remained in the air has been more than doubled. During the international balloon races from Berlin, in October, 1906, some of the balloons kept afloat about 24 hours, but owing to the fact that they moved in a circuitous course, none of them landed more than 250 miles from Berlin, and this was taken as the record for the distance traveled. The distance traveled by Lieut. Lahm in the Gordon-Bennett race, which he won last year, is officially stated to be 647 kilometres from Paris, which is 402 miles, and not "about 410 miles," as he states on page 42 of his article in the Aero-Club book, "Navigating the Air."

Finally, it may be interesting to mention that one of the early balloons, carrying only self-recording instruments, drifted 700 miles over Europe. This balloon, which was made of silk or other fabric, lost its gas slowly and so kept afloat nearly 11 hours, but even the small rubber balloons, which are now used for meteorological purposes and which burst on reaching their extreme altitudes, may go a long distance. For example, one of these "sounding balloons," which was despatched November 25, 1904, by the Blue Hill Observatory from St. Louis, fell 280 miles away, the journey lasting only 167 minutes, and the balloon during that time rising to a height of seven miles.

A. LAWRENCE ROTCH.

Blue Hill Observatory,
September 28, 1907.

SANTOS DUMONT NO. 16.

Several modifications have been made. Substitution has been made of a three-blade propeller for the old two-blade. The old aluminum framework rested on one bicycle wheel. It has since been enlarged to take an axle with two wheels and this will assist in maintaining balance in the preliminary runs. It is necessary to attain a speed of from 37 to 50 miles an hour.

RARE AERONAUTIC BOOKS FOR SALE

This magazine will publish each month a list of such rare books relating to aeronautics as it is able to secure.

If you desire any of those listed, kindly send check with your order for the amount stated. Should the book ordered be sold previous to the receipt of your order, the money will be promptly returned.

Astra Castra (Hatton Turner). Royal 4to, cloth, gilt top, uncut, London, 1865............$15.00

An Account of the First Aerial Voyage in England (Vincent Lunardi). Portrait of Lunardi by Bartolozzi and plates. Crown 8vo, half calf, uncut, London, 1784. Autograph "V. Lunardi" on fly-leaf......... 15.00

Travels in the Air (James Glaisher). 8vo., cloth, London, 1871. .... 10.00

Crotchets in the Air (John Poole). 12 mo., cloth, London, 1838 .... 5.00

By Land and Sky (John M. Bacon). Four illustrations. 8vo, cloth, uncut, London, 1901 2.50

A Balloon Ascension at Midnight (G. E. Hall). Plates by Gordon Ross. 8vo, boards, uncut. San Francisco, 1902. Limited edition 2.50

Five Weeks in a Ballcon (Wm. Lackland). 12 mo., cloth, N. Y., 1869..................... 2.50

Wonderful Balloon Ascents (F. Marion). 12 mo., half leather, N. Y., 1871 .... 2.50

My Airships (Santos-Dumont). Illustrated. Crown 8vo, cloth, uncut, London, 1904......... 2.50

The Dcminion of the Air. The story of aerial navigation. Illustrations from photographs. Crown, 8vo, cloth, London, n. d. 2.00

My Life and Balloon Experiences. Photograph of author. Crown, 8vo, cloth. London, 1887 .... 2.00

Travels in Space (G. S. Valentine and F. L. Tomlinson). Introduction by Sir Hiram Maxim, 61 plates. 8vo, cloth, London, 1902. .... 2.00

Balloon Travels (Robert Merry). 12 mo., cloth, N. Y., 1865 ....$ 2.50

Aerodynamics. Illustrated. 1891. 2.00

Conquest of the Air (John Alexander). 12 mo., cloth, London, 1902 .... 2.00

The Motor and its Chief Application, Wings, Propulsion in Air, etc. (Com. of Pat., 1849). 8vo., paper 1.50

La Machine Animale (J. Marey). Illustrated, 8vo, cloth, Paris, 1878, French 1.25

Balloons, Airships and Flying Machines (Gertrude Bacon). 12 mo., cloth, N. Y., 1905 .... 1.00

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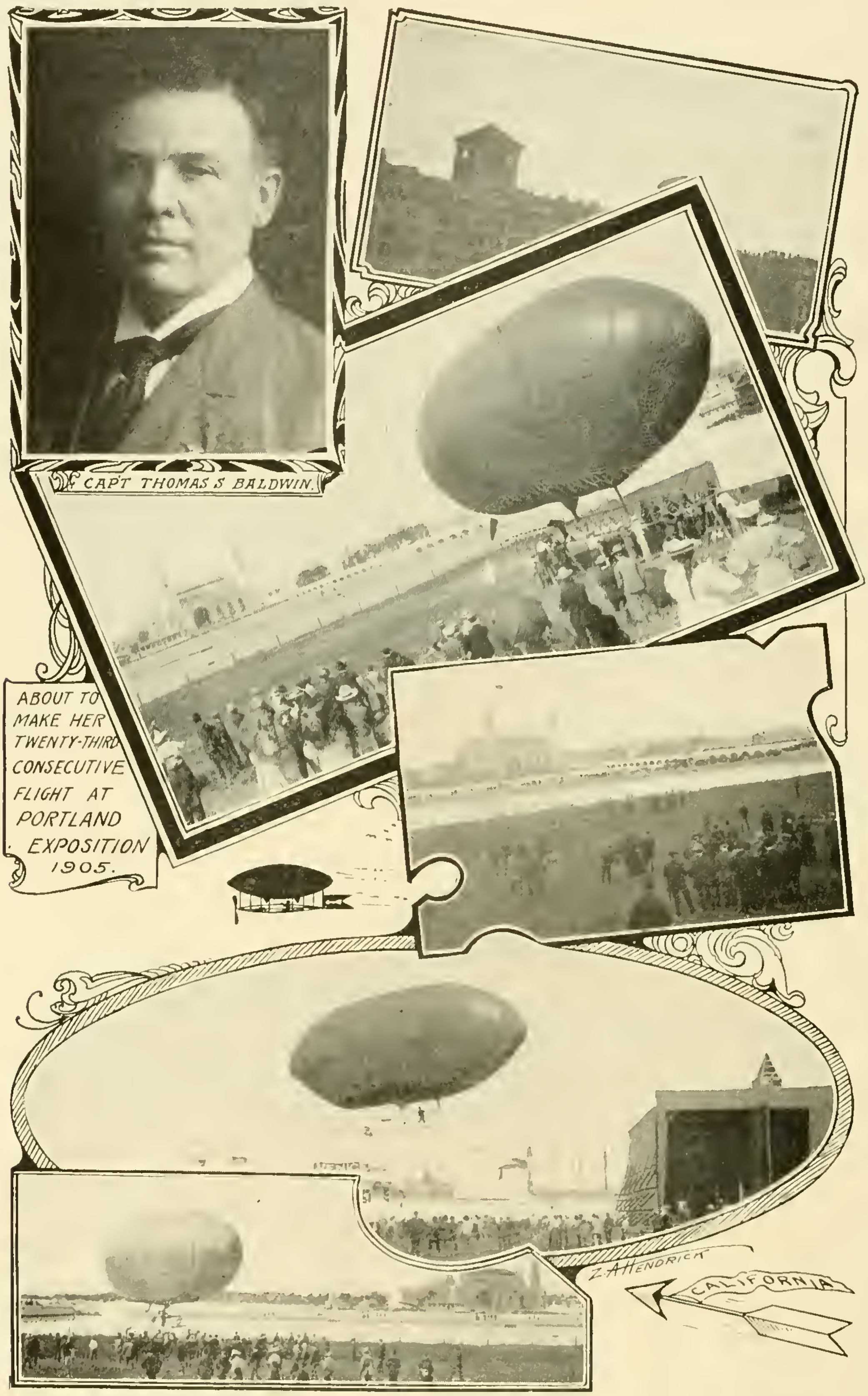

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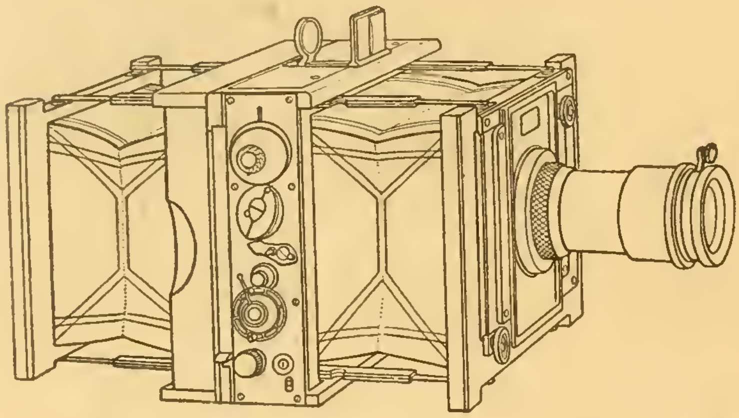

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SUMMARY

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LAST CALL FOR THAT PRIZE!

We have constantly been telling of the necessity for a money prize for gasless machines. We have tried to get some enthusiastic individual to devote Five Thousand Dollars for this purpose but we have failed. We have tried to secure contributions from various people to make up this sum——and have failed. At last, almost in desperation, we outlined a plan for 200 to give $25 each and take a share in an interest to be acquired in the patent covering the machine which won the prize. With this bait we did manage to secure the promise of ten Aero Club members to join the syndicate (not "skindicate"). Three others also offered their aid.

The possibility of obtaining this prize seems so remote that we express our sincere appreciation of the promised co-operation of our twelve friends following and ask them to consider the matter as if it had never been broached:—Lee S. Burridge, Wilbur R. Kimball, Octave Chanute, Thos. G. Washburn, Alan R. Hawley, William Hawley, George M. Kirkner, Dr. C. T. Adams, Chas. Jerome Edwards, A. L. Westgard, Henry A. Davis, William Morgan, Ourselves.

NEXT YEAR'S GORDON BENNETT.

There has been a great deal of feeling in the Aero Club over the selection of the representatives of America in the 1907 Gordon Bennett. It is to be hoped that next year an elimination race will be held, which will go far towards the selection of the best men and will definitely prevent any criticism of the action of the committee on selection. The charge of favoritism could not then be brought and everyone would, perforce, be satisfied.

GORDON BENNETT RACE.

Goerz Photo. GENERAL VIEW OF THE PARK, POMMERN ON THE EXTREME RIGHT.

On October 21, in the golden rays of the setting sun, departed from Forest Park at Saint Louis nine balloons, bound for—one knew not where. As the monster globes left the ground and drifted slowly away to the West in the gathering dusk, one felt a sense of awe and unnaturalness. The scene was an inspiring one, with the fading sun lending a beauty indescribable. A hundred thousand watched the receding spheres out of sight and reluctantly returned to their homes and hotels to wait for news.

From the number of places that reported balloons one might have been led to believe that the sky was a sort of balloon-milky way, but we knew better.

The first word of a landing was from Major Hersey. Another long wait before we heard from the English balloon, the second to descend, after making the shortest distance. Then no more reports of landing till the morning of the 23d when they came fast for awhile. By noon we had heard from all except the Isle de France and we were wondering if it would beat the Pommern. At last we heard the news that the Isle of France had at last dropped and we pored over the maps for the last time. The race was over.

Perfect gas was supplied and the inflation went on rapidly, indeed faster than the sand bags could be moved. All the balloons started on schedule time and there was not a hitch. Great credit is due the Commission in charge of arrangements and special credit must be given to Mr. Stevens whose direction of the inflation was admirable. Like a general he deployed his soldiers and the filling went on like a well-planned attack. French clubs can no longer boast of superiority in the handling of a balloon race.

President Bishop has been authorized by the Board of Directors of the Club to challenge the winning club in behalf of America.

Order of Finish.

These distances are figured to the exact spot of landing and are official.

	BALLOON	PILOT	DESCENT AT	MILES
1	Pommern	Erbslöh	Asbury Park, N. J.	872.25
2	Isle de France	Le Blanc	Herbertsville, N. J.	866.87
3	Dusseldorf	Abercron	Dover, Del.	797.35
4	America	McCoy	Patuxent, Md.	726.42
5	St. Louis	Hawley	Westminster, Md.	714.50
6	Abercron	Meckel	Manassas, Va.	690.55
7	Anjou	Gasnier	Mineral, Va.	672.79
8	United States	Hersey	Caledonia, Ont., Can.	623.95
9	Lotus II	Brewer	Sabina, O.	360.67

Prizes Won.

1st. Oscar Erbslöh, Gordon Bennett Cup and $2500, given by Mr. Bennett.
2nd. Alfred Leblanc, $1000, given by business interests of St. Louis.
3rd. Von Abercron, $750, given by business interests of St. Louis.
4th. McCoy, $500, given by business interests of St Louis.
5th. Hawley, $250, given by business interests of St. Louis.

In addition, the contestants finishing first, second and third receive one-half, one-third and one-sixth, respectively, of the entrance fees. All contestants will receive medals.

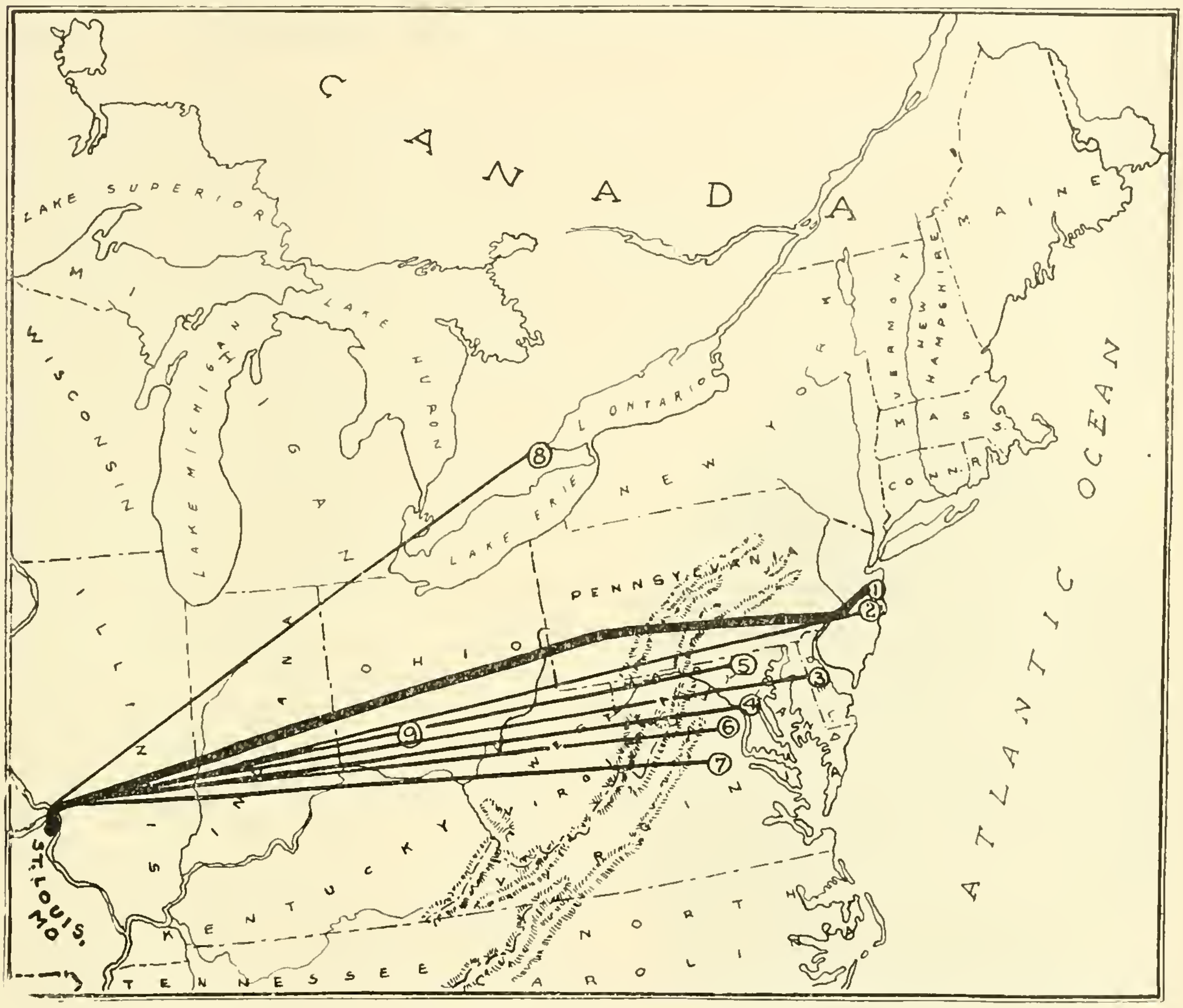


CHART SHOWING GENERAL DIRECTION TRAVELLED BY BALLOONS. NUMBERS REFER TO ORDER OF FINISH.

New Records Established.

Record duration in balloon races by balloon "Isle de France," 44 hours and 5 minutes.

Record distance in the United States, measured in a straight line, beating former record of 870 miles made by John Wise, by about 2 miles.

World's Records.

Record distance, 1193 miles, held by Henry de la Vaulx, Paris to Russia, October 9, 1900.

Record duration, 52 hours, held by Dr. Kurt and Dr. Alfred Wegener, April 5–7, 1906.

STORY OF WINNER'S TRIP.

By Oscar Erbslöh.

Oscar Erbslöh, a German wholesale merchant, was born in 1879, at Elberfeld. He served in a cuirassier regiment. He is known in Germany as a successful horse-show exhibitor. His aeronautic experience dates from 1904. In 1905 he qualified as pilot in the Niederrheinischer Verein für Luftschiffahrt, of which society he is now a director. He has made 54 free ascensions, landing in Germany, France, Belgium and Holland. His most noteworthy voyages were one from Dusseldorf to Scrau of 940 miles, one from Paris to Dieuze, lasting 22 hours. He was aid to Von Abercron in the first Gordon Bennett race. In the balloon used at St. Louis he won the Brussels International Competition, September 15th last, against 22 competitors. After a voyage of 30 hours he landed at Bayonne, France, a distance of 630 miles.

When I left St. Louis at four o'clock I did not like very much to start first because I could not see any other balloon before me to act as pilot. In every other race I saw a great deal of the other balloons going up ahead of me for the different currents and the speed of the wind at different altitudes. So I conferred with my companion, Mr. Clayton, and we decided it would be best for us to go at about five thousand feet elevation, and after going towards the Northwest at the start we turned around very soon and at this height traveled toward the East. That was near Alton and we stayed the whole night at this altitude.

OSCAR ERBSLÖH.

It was very hard for us to keep our bearings by the maps because there were no mountains on them but only rivers or railways. We crossed quite a number of rivers and cities and the next day, as we did not know very well where we were, we went down to ask people, thinking we could get a correct answer as many papers had instructed the people to answer immediately to the aeronauts if they asked. But when we shouted down, "What is the name of your town,' or "what is the name of the next railway station," they answered, "Where did you come from?" And when we told them we came from St. Louis they wanted to know, "Where are you going?" When we asked them the third time we were so far away that we could not understand what they answered. So that it was very hard to tell where we were. Sometimes a woman was standing in the house door and didn't know what to do when we asked her, but just went inside and shut the door. She may have been afraid of us.

About three o'clock in the afternoon we came to a farmer who gave us the right answer and told us we were near Port Washington, Ohio. After that we did not lose our bearings because I knew it was very important to keep our bearings on account of the ocean, and without knowing the exact place where we came to the ocean we might have thought it a bay or large river or something like that and would have tried to cross it and so gone out over the sea. In the evening, at about seven o'clock, we passed over Pittsburg, and it was very interesting to see this large city, with the lights and fires, railways, street cars and all those things, and it was just the hour for the moon to rise. After that we had a splendid voyage.

During the night we crossed the Alleghanies and it was a lovely sight for us to look down on the valleys and mountains, following the surface of the earth.

Half an hour before we got to Philadelphia we saw the splendid residence suburbs and came down to 500 feet and asked how far to Philadelphia. They told us 38 miles, and then 26 miles, and we enjoyed the view very much. When we arrived at Philadelphia there was a thick fog in the valley, with the tops of the chimneys apparently about a foot out of this fog. It was early morning and the smoke began to curl out of the chimney tops. Down in the fog we could see the electric cars running lighted, looking just like submarine boats. Passing over Philadelphia at a speed of about 35 miles an hour we heard the whistles of the factories, which made so much noise that we could scarcely hear our own words. We were forced to go a little higher as in our direction there was the tower of a church. It was not our intention to ascend but were forced to do so on this account. We had intended to wait until the sun had risen and taken us up himself. As we watched, the sun rose and drove the fog away.

After leaving Philadelphia we tried for the last time to get a more northerly direction, because we still hoped to go over New York and get into Massachusetts or Connecticut. But we could not find a current towards the northeast, although we went up to 10,000 feet and found only a little current going east. So that we saw by our maps that we would get to Asbury Park. We tried when we came slowly down to get as near to the coast as we could, but as we did not see any place just at the sea-shore fit for landing, we had to come down in the street of the city and landed with our car standing in the street and the balloon lying on some bushes about three or four feet high.

When we got out of our car there were about two or three hundred people standing around, and after ten minutes there were about a thousand. It was such a crowd that we could scarcely stand up, and there was no way to attend to our balloon—we were so pressed in by this crowd that we couldn't make a step. I found two police officers and asked them to take the guide rope and make a circle around the balloon to keep the public out. Then we were able to take the net off and carry the balloon out of the bushes to another place and fold it up. I was very sorry when I saw a piece of the net gone. I think a man took it as a souvenir. I had four flags with me, and a German who came up asked me whether I could not give him my German flag. I gave it to him, and after I had been asked whether I would sell my other flags, I told the man I would not do it. In the meantime they took them away.

Several gentlemen came up and invited me to go down in their automobile to the telegraph office and said that there was a wagon of the express company coming to take the balloon to the station. When I arrived at the telegraph office there were about twenty or thirty there, and the Mayor of the place made a speech and welcomed us to the City of Asbury Park, inviting us for luncheon as guests of the City. It was a very hearty reception. About four o'clock we left for New York.

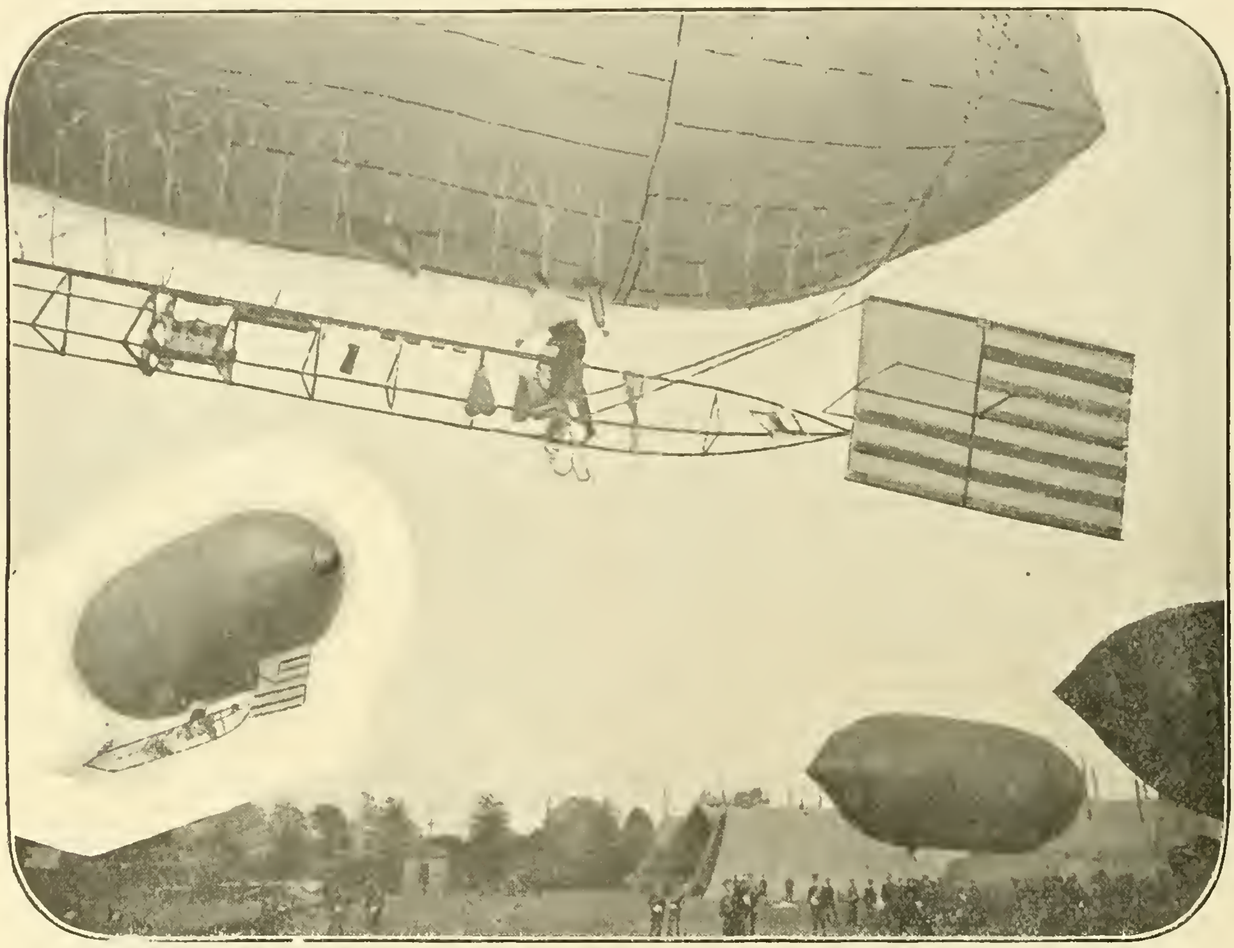
The whole trip was a very fine one and I enjoyed it very much. The weather was splendid and the moon very useful to us, as we had twenty-four hours of night altogether. I think it was the finest trip I ever made in my life, and I shall never forget it. I hope that I shall again have occasion to come back and make one more trip to this country. It may be that I will come again in two years. If the Americans come over to Germany next year I don't doubt that they will come to take back their prize, and so the Germans will have the occasion to come once more to this country where we have found such a warm and hearty welcome and reception, and we hope to give this reception to our American friends in Berlin when they come there for the next year's contest.

FLYING MACHINE AND DIRIGIBLE COMPETITIONS AT ST. LOUIS.

It is to be regretted that there were no gasless competitions as had been arranged for on Tuesday, October 22, the day after the Gordon Bennett Race. Mr. Ludlow constructed one of his kites and tried to get it into the air, towed by an automobile, on Wednesday. The space in the enclosure was too short in which to get up speed, besides not being suited for fast running. After several unsuccessful attempts further trials were given up.

H. H. Wixon, of Chicago, had delivered on the grounds a beautifully constructed large model aeroplane of distinctive type but it was not unpacked. General regret was expressed that Mr. Wixon did not give a demonstration. Many were interested in the machine as it lay in an open crate.

The same day, however, Captain Thomas S. Baldwin gave two fine exhibition flights in the California Arrow. The weather was favorable and the flights were a



Goerz Photo.

CAPTAIN THOMAS S. BALDWIN'S CALIFORNIA ARROW.

pronounced success. Various manoeuvers were executed and at all times the ship was under beautiful control. "Jack" Dallas also made a flight in The Strobel but met with trouble. The motor stalled as he was about to land and the wind drove the craft in the nearby service wires. Luckily no great damage was done. Cromwell Dixon, the fourteen year old boy, of Columbus, after a bad start left the Park in his "skycycle" and pedalled over the city, landing across the river at Vienna, a distance of seven or eight miles.

On Wednesday was witnessed the pretty sight of four shining silk dirigibles sailing 'round. Each one had a designated position in the enclosure, with a guard of soldiers. The course was laid from a line in the grounds out to and around the Blair Monument and return, three-quarters of a mile. A gusty wind was blowing in the face of the pilots as they started.

Promptly at two o'clock Captain Baldwin climbed on the frail looking frame of the California Arrow and started. A gust of wind caught him and whirled him around. Quickly the ship was again headed into the wind but tacking had to be resorted to in order to reach the Monument. Horace B. Wild, who defeated Beachey at Chicago, sailing the Bayersdorfer-Yager Comet, also had a good start but got in bad currents almost immediately, and circled around in a vain attempt to make headway. The engine stopped and the wind blew the ship swiftly over the Park to the south where it landed a half-mile away.

In the meantime Jack Dallas in The Strobel started low during a calm and was well on his way to the Monument when Captain Baldwin finished his first trip, in 9:30. Dallas made the course in good shape but just as he neared the grounds the

Goerz Photo. JACK DALLAS STARTING.

driving chain broke and the ship drifted over the finish and into the open fields beyond, the time for the course being 8:50.

Lincoln Beachey then started easily and travelled in a nearly direct line, out and back, doing it in 7:15. During an intermission the Ludlow kite was brought out and towed by an automobile several times within the enclosure in a useless attempt to get it in the air. The confined space and roughness of the ground both tended to defeat the trials.

The restless crowd was anxious to see the dirigibles race again and Captain Baldwin, thoroughly aroused by his defeat in the first series, made his second start. The wind was much worse this time and he could not even get to the Monument. After heading again and again into the wind without making much progress forward he gave it up and made his descent.

In another attempt to lower the record set by Beachey in his first flight, Dallas started for the second time but, while lessening his own former time, failed to touch Beachey's. After Baldwin's second trip the Arrow was taken to the tent and the bag removed and transferred to a new and untried frame, with two 2-bladed

propellers and a 20-horsepower engine. After the net was attached it was found that in the haste of building this new frame and installing a heavier motor in the two weeks left before the race after the idea came into mind, that there had been an error in judgment in the placing of the motor to preserve balance and the bag had to be taken off and re-attached to the old frame. G. H. Curtiss had intended to ride in this third trip with the new frame and engine. The transfer was rushed and soon Baldwin was off on his third trip, doing much better this time and lowering Beachey's record by 10 seconds.

Dallas started again and almost immediately after, Beachey; the former on the third trip, Beachey on his second. Over the top of the St. Louis Aero Club house could be seen the two ships, end on, one going, the other coming. When Dallas crossed the line again in 6.10 he stood the winner, but his victory was short lived. Straight as an arrow and with the speed of a bird came Beachey, with a record of 4:40. The landing was prettily made and the enthusiasm of the great crowd that filled the reviewing stands and blocked the wide drives knew no bounds.

Goerz Photo. LINCOLN BEACHEY DESCENDING.

Cheer after cheer went up when the winner's time was announced. America had never seen such a demonstration of airships before, whether in number or flights.

As the crowds left, Wild could be seen struggling back to his tent. The numerous starts and landings he had made in his game effort to regain the enclosure had lost him a third of his gas and the bag could be seen flapping up and down in waves as the operator tilted it up or down. At last he descended almost in front of his tent, just in time to get an ovation.

Universal sympathy was expressed for the veteran Captain Baldwin who is so well-known in St. Louis, but fate just seemed to be perverse. As the sun neared the horizon the wind became less and less and when Beachey started on his second and last flight there was hardly a breath of air. A nasty puff seemed to spring

up each time Baldwin started—none of the others had that ill luck to as great a degree.

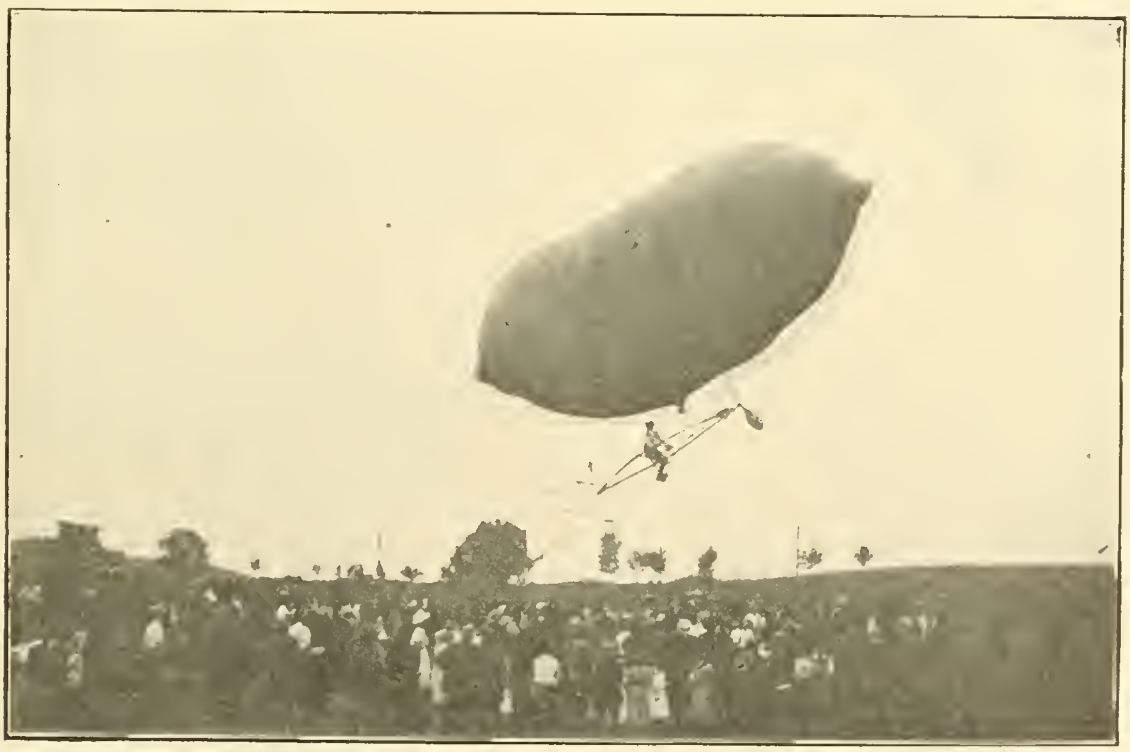
Of the $2,500 offered in prizes, $1,500 goes to Beachey, $750 to Jack Dallas, and $250 to Captain Baldwin. Cromwell Dixon also received a purse of $375 from the St. Louis Club. Following is the order of finish and time. It is to be noted that the best records were made in the last flights later in the afternoon.

Operator.	*Time.*
Baldwin	9 m. 30 s.
Wild	Did not finish.
Dallas	8 m. 50 s.
Beachey	7 m. 15 s.
Baldwin, second trial	Did not cover course.
Dallas, second trial	7 m. 23 s.
Baldwin, third trial	7 m. 5 s.
Dallas, third trial	6 m. 10 s.
Beachey, second trial	4 m. 40 s.

Points of Interest.

California Arrow.—Envelope 9,000 cu. ft. capacity, length 56 ft., diam. 18 ft., silk; Curtiss 4-cyl., air-cooled engine, 15-hp., weight 100 lbs., 1,500 r. p. m.; 2-bladed propeller, canvas, 10 ft. diameter; spruce triangular frame, cable stayed, weight 75 lbs.; no ballast carried; weight of operator 210 lbs.

The Strobel.—Envelope 6,000 cu. ft. capacity, length 52 ft., diam. 15 ft., silk; own make of engine, 4-cyl., air-cooled, 10-hp., 75 lbs., 1,500 r. p. m.; 2-bladed



CROMWELL DIXON'S SKYCYCLE.

propeller, canvas; spruce laminated triangular frame, 42 ft. long, steel wire stayed; rudder has horizontal planes.

The Beachey.—Envelope 37 ft. long, silk; motor and frame same as The Strobel; 2-bladed propeller, with blades about a foot square, of wood, screwed on the ends of the arms.

The California Twin Screw.—Envelope same as California Arrow; 4-cylinder

Curtiss air-cooled 20-hp. motor, weight 110 lbs., 1,350 r. p. m.; frame weighs 105 lbs.; two 2-bladed propellers, 9 ft. diam., turning in opposite directions.

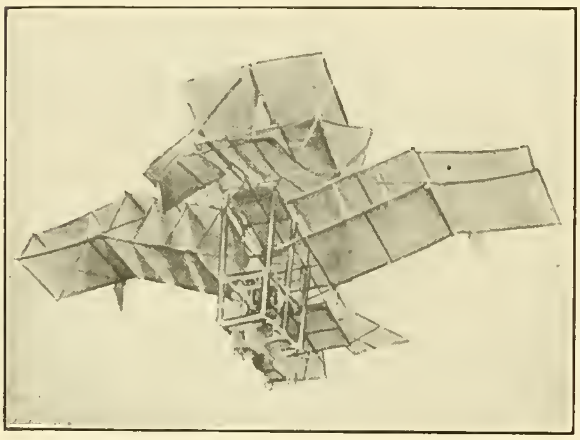
The Comet.—Envelope 10,000 cubic feet capacity, length 55 ft., diameter 18½ ft., silk; frame spruce, length 40 ft.; engine 7-hp., weight 44 lbs., rebuilt Curtiss 2-cylinder opposed, no crank case.

Cromwell Dixon Skycycle.—Envelope 40 ft. long, diameter 17 ft.; the frame consists of two strips bowed like the gunwale of a boat, with a bicycle frame with pedals hung about in the center, chain drive to 2-bladed propeller.

A NEW FLYING MODEL.

George A. Lawrence, of Sayre, Pa., who has been experimenting for a considerable length of time, seems to have succeeded very well thus far with his models. Mr. Lawrence has made the following statement to this magazine:

"With the large model illustrated below I have succeeded in making several very successful flights. On October 1st it made seven small flights, the longest being a little over 200 feet, at a height of about 15 feet. Another flight was made on October 11 of about 60 feet, during which flight the above photograph was made, and also one of less distance. The object of these low flights was to test the efficiency of the rudder, the test proving entirely satisfactory.



THE LAWRENCE MODEL IN FLIGHT.

"The 4-cylinder, 2-cycle, 60-h.p., 650 r. p. m. engine for the large machine is one of my own design and construction and will be completed in the early spring. Nearly all the supporting surfaces can be adjusted to any degree of angle while the machine is in flight. The weight will approximate 980 pounds, including myself as operator, supported by about 1,100 square feet of surface. The spread from tip to tip of wings will be 37 feet, 28 feet from front to rear, and 18 feet in height from top of plane to the wheel base. There are three vertical and four horizontal rudders. The machine is also equipped with a 9-h.p. emergency engine, located in the rear, for safety in forward gliding to the earth in case of accident to the big one. The propeller is 3 ft. in diameter and will revolve at 1,500 r. p. m., as I don't want any more than 50 or 60 pounds pressure forward."

Watching the "Heavier than Air" Experiments

FLASHLIGHT OF CONGRESS
From left to right, front row: Kimball, Hammer, Zahm, Hewitt, Chester, Moore, Allen, Post, Jones.

INTERNATIONAL AERONAUTICAL CONGRESS.

President : PROFESSOR WILLIS L. MOORE.
Secretary : DR. ALBERT FRANCIS ZAHM. Chairman Gen'l Committee : WM. J. HAMMER.
Chairman Executive Com.: AUGUSTUS POST. Sec'y Committees : ERNEST LA RUE JONES.

Summary of Meeting.

Morning Session, October 28.

The meeting was called to order by the Chairman of the General Committee, Mr. William J. Hammer, at 11 o'clock in the morning, in the Assembly Room of the Automobile Club of America, New York.

Mr. Hammer explained that on account of the close proximity of the dates of the Gordon Bennett International Aeronautic Race, the Annual Aero Club Show, and the Congress, the previous removal of the entire aeronautic exhibit from Jamestown Exposition to the Exhibition at New York and the improbability of securing an attendance at Jamestown, it had been decided by the officers of the Congress to hold its sessions in New York on the dates scheduled.

The Chairman then introduced the President of the Congress, Professor Willis L. Moore, Chief United States Weather Bureau, who addressed the meeting, reading portions of his paper, a "General Resumé of Aeronautics."

Messrs. J. C. McCoy, Alfred Leblanc, Rene Gasnier, and Major Henry B. Hersey, were then called upon in turn by the President and cheerfully responded with accounts of their trips in the Gordon Bennett Race at St. Louis.

Admiral C. M. Chester was introduced and read a very interesting paper, "The Airship for the Navy," a consideration of the aid which an airship would be to the Navy in time of war.

Afternoon Session, October 28.

General James Allen, Chief Signal Officer of the United States Army was next introduced by the President. General Allen told of the present activity of the Signal Corps in aeronautic work and of its plans for the future as now under way.

A committee of three, Messrs. J. C. McCoy, Professor A. Lawrence Rotch, and Carl E. Myers, upon motion duly seconded and unanimously carried, was appointed to draft a resolution expressing the sense of the meeting as regards the urging of the United States Congress for an appropriation for aeronautical work in the Army. The following resolution was subsequently submitted and unanimously approved and a copy ordered transmitted to President Roosevelt: "Resolved, by the International Aeronautical Congress assembled together at New York, that the President of the United States be requested to call the attention of Congress to the advisability of providing the departments of the Government charged with these duties, funds sufficient to establish aeronautical plants commensurate with those of other nations."

At the request of the President, Major George O. Squier, of the United States Signal Corps at Fort Leavenworth, Kans., supplemented the remarks of General Allen by a general review of the advantages of an aeronautic division in active operations.

A general discussion of the properties of coal and hydrogen gases, the availability and cost of each, their manufacture, et cetera, then followed.

Mr. Carl E. Myers was called upon and read his paper, "Hydrogen Gas Ballooning," a summary of his experience with hydrogen for balloons.

The President next called upon Mr. Wilbur R. Kimball, who told of the recent progress abroad with gasless flying machines and of his experiments with a model helicopter.

The possibility of aeroplane flight without motor was discussed by Elias E. Ries, who has been experimenting toward this end.

Herr Paul Meckel, the third representative of the German aero club in the Gordon Bennett Race, then gave his story of the trip, followed by Professor Moore's remarks on the occasion of the Gordon Bennett Race being held in this country this year and its tranference to Germany in 1908.

A telegram was read from Lieut.-Col. William A. Glassford, expressing his regret at not being able to be present to read his paper, and the President called upon Mr. Gustave Whitehead, who told of the active experimenting now in progress in the United States, the possibilities of success in the near future, and his own work and plans.

Doctor A. F. Zahm presented the following papers, in full or by abstract: "Soaring Flight," by Octave Chanute; "Use of the Gyroscope in Flying Machines," by Lieut. Robert Henderson, Chief Engineer, U. S. S. Missouri; "Some Model Aeroplane Experiences and Details of a Man-Carrying Aeroplane," by A. V. Roe, member of the Aero Club of the United Kingdom; "Experiments with Model Flying Machine," by Edward W. Smith, University of Pennsylvania; "The Best Inclinations for the Surfaces and Propeller Shafts of Dynamical Airships," by T. W. K. Clarke, Associate Member Inst. C. E., Surrey, England; "Curvature a Relative Term," by George A. Spratt; "Equilibrium and Control of Aeroplanes," by L. J. Lesh; giving a resumé of same, illustrated by diagrams.

At four o'clock the meeting adjourned for the day.

Morning Session, October 29.

On the meeting being called to order by the president, Mr. Bishop, President of the Aero Club of America, was called upon and delivered a few remarks on the Gordon Bennett Race. After which, Captain Chas. De F. Chandler, of the United States Signal Corps, told of his trip with Mr. McCoy in the balloon race, supplemented by a few remarks from General Allen.

Herr Oscar Erbslöh, the winning German contestant in the Gordon Bennett described his long trip, the landing, and told what the Americans might expect when they go to Germany next year to bring back the cup.

A resolution was passed extending to Herr Erbslöh and his aide, Mr. H. H. Clayton, the hearty felicitations of the Congress on their success in winning the Cup.

A resolution was passed extending by cable the felicitations of the Congress to Mr. Henry Farman on his successful aeroplane flight of October 26.

Dr. P. Polis, of the German Meteorological Survey at Aachen, who is in the United States to study American methods in meteorological stations, told of the work being done in Germany and of what he saw in our own bureaus.

Dr. A. F. Zahm, Professor of Mechanics at the Catholic University of America, Washington, gave an abstract of his paper left over from the preceding day, "Wind-Tunnels for Aerodynamic Experiments, their Construction and Equipment," with graphic illustrations.

The succeeding paper, "First Observations with Sounding Balloons in America, Obtained by the Blue Hill Observatory," was delivered by Professor A. Lawrence Rotch, Director, Blue Hill Observatory. This paper brought out a number of questions and Professor Moore stated the plans of the Weather Bureau for introducing the work begun previously by Professor Rotch.

Professor A. J. Henry delivered "The Use of Upper Air in Forecasting," giving a general idea of the methods for obtaining date upon which to base forecasts.

Mr. S. D. Mott then addressed the meeting on his work with helicopters designed for the use of meteorologists in securing upper air data.

Afternoon Session, October 29.

Professor W. J. Humphreys, Director of Mt. Weather Observatory, lectured after lunch on the "Possibility of Extending Our Knowledge of the Sun and of Atmospheric Absorption."

The two papers of Professor A. G. McAdie, of the Weather Bureau at San Francisco, "Extension of Area of Weather Reports for Aeronauts," and "Lightning As an Element of Danger in Balloon Work," were read in Professor McAdie's absence by Professor Henry, followed by a short discussion of the use of aluminum coating for balloons and its relation to lightning.

Dr. W. R. Blair, of the Mt. Weather station, was then introduced and gave an interesting talk on "Kite Manipulation and the Record Flight" of October 3; 23,000 feet.

Mr. E. B. Bronson suggested the holding of another international congress next year and, after general discussion, Messrs. Cortlandt Field Bishop, Augustus Post, William J. Hammer, Professor A. Lawrence Rotch, Charles M. Manly, Dr. A. F. Zahm, and Octave Chanute, were appointed to consider the advisability of holding an annual congress in this country and to arrange for affiliation, if deemed advisable, with foreign international congresses.

Dr. Zahm presented, "Principles Involved in the Formation of Wing Surfaces and the Phenomenon of Soaring," by Dr. J. J. Montgomery, Professor of Physics, Santa Clara College, and "Observations and Tests of Marvelous Soaring Power of Birds in Calm and Storm," by Israel Lancaster. Before reading the latter paper, Dr. Zahm said: "In the latter eighties Mr. Lancaster described, at a meeting of the American Association for the Advancement of Science, some remarkable instances of soaring flight which set Professor Langley to thinking about the possibility not only of soaring, but of flying through the air. Professor Langley began his aeronautic work at that time and never after left it off."

A resolution of thanks to the Automobile Club of America was then passed, expressing appreciation by the Congress of its kindness in offering the use of its rooms.

Messrs. Cortlandt Field Bishop, Dr. A. F. Zahm, and Mr. Ernest L. R. Jones,

were appointed a Publication Committee to arrange for the printing of all the papers and discussions presented to the Congress, same to be delivered in bound volumes to members of the Congress.

Dr. W. J. Humphreys read, in the absence of the author, the paper of Professor Cleveland Abbe, of the U. S. Weather Bureau, on "Helicopters for Aërial Research."

A vote of thanks was tendered Dr. Zahm for his efforts in securing the papers and his aid toward making the Congress a success.

A telegram of congratulations was read from Professor David Todd, dated at the summit of the Andes.

After being favored with some aeronautic motion pictures by Mr. F. H. White, the Congress closed.

Papers and Addresses Presented.

Presidential Address.—General Résumé of Aeronautics; by Prof. Willis L. Moore, Chief of the United States Weather Bureau, Washington, D. C.

Addresses of the contestants in the second James Gordon Bennett International Cup Race.

The Air-ship for the Navy; by Admiral C. M. Chester, United States Navy, Washington, D. C.

Our Army and Aërial Warfare; by Lieut.-Col. William A. Glassford, Chief Signal Officer of the Department of Missouri, United States Army, Fort Omaha, Neb.

Use of the Gyroscope in Flying Machines; by Lieut. Robert Henderson, Chief Engineer, U. S. S. Missouri, Boston, Mass.

Some Model Aeroplane Experiences and Details of a Man-Carrying Aeroplane; by A. V. Roe, member of the Aero Club of the United Kingdom, 47 West Hill, Wandsworth, London, S. W., England.

Experiments with Model Flying Machine; by Edward W. Smith, University of Pennsylvania, Philadelphia, Pa.

The Best Inclinations for the Surfaces and Propeller Shafts of Dynamical Airships; by T. W. K. Clarke, Associate Member Inst. C. E., St. Catherine, Maple Road, Surbiton, Surrey, England.

Curvature a Relative Term; by G. A. Spratt, R. F. D. No. 1, Coatesville, Pa.

Equilibrium and Control of Aeroplanes; by L. J. Lesh, 200 Peel St., Montreal, Can.

Wind-Tunnels for Aerodynamic Experiments; their Construction and Equipment; by Dr. A. F. Zahm, Professor of Mechanics, the Catholic University of America, Washington, D. C.

On the First Observations with Sounding Balloons in America Obtained by the Blue Hill Observatory; by Prof. A. Lawrence Rotch, Director, Blue Hill Observatory, Hyde Park, Mass.

The Use of Upper Air Data in Forecasting; by Prof. A. J. Henry, U. S. Weather Bureau, Washington, D. C.

The Possibility of Extending Our Knowledge of the Sun and of Atmospheric Absorption; by Prof. W. J. Humphreys, Director of Mount Weather Observatory, Bluemont, Va.

Extension of Area of Weather Reports for Aeronauts; by Prof. A. G. McAdie, U. S. Weather Bureau, 1500 Merchants Exchange Building, San Francisco, Calif.

Kite Manipulation, and the Record Flight; by Dr. W. R. Blair, U. S. Weather Bureau, Bluemont, Va.

Observations and Tests of Marvelous Soaring Power of Birds in Calm and Storm; by Israel Lancaster, Fairhope, Ala.

Principles Involved in the Formation of Wing Surfaces and the Phenomenon of Soaring; by Dr. J. J. Montgomery, Professor of Physics, Santa Clara College, Santa Clara, Calif.

Helicopters for Aërial Research; by Prof. Cleveland Abbe, U. S. Weather Bureau, Washington, D. C.

Hydrogen Gas Ballooning; by Carl E. Myers, Frankfort, N. Y.

Lightning as an Element of Danger in Balloon Work; by Prof. A. G. McAdie.

Power Required to Drive an Airship; by Prof. C. M. Woodward, Dean of the School of Engineering and Architecture, Washington University, St. Louis, Mo.

Soaring Flight; by Octave Chanute, Consulting Engineer, Chicago, Ill.

Publication Notice.

The addresses, papers and discussions presented to the Congress will be published serially in this magazine and at the earliest date possible bound volumes will be distributed without charge to those holding membership cards in the Congress. Others may purchase the volume at a consistent price when ready or may take advantage of immediate publication by subscribing to this magazine at the regular rate.

Following will be found the opening address of the President, Professor Willis L. Moore, D. Sc., LL.D., Chief of the U. S. Weather Bureau, a "General Resumé of Aeronautics," and those of Mr. J. C. McCoy and Alfred Leblanc, contestants in the Gordon Bennett Race, representing America and France.

President's Address.

We meet to interchange ideas on aeronautical subjects at a particularly auspicious time. In calling attention to the more important achievements in the development of methods for the conquest of the air, and in forecasting the future of this important field of human activity, I have drawn liberally upon the knowledge and experience of that splendid man and engineer Octave Chanute. Since the last International Aeronautical Congress, that at Milan in 1906, two practical solutions of the problem of aerial navigation have become established. Several dirigible balloons have been produced which are truly and efficiently navigable, and a dynamic flying machine has been evolved which has flown many times, the maximum being 24 miles at a stretch. Moreover, there have been great advances in meteorology, so that we are now well on the way to the domain of the air.

There have been previous congresses on aerial navigation, more or less international; at Paris in 1889 and in 1900, at Chicago in 1903, at St. Louis in 1904, and at Milan in 1906. There was also a conference at Brussels from the 12th to the 15th of September of this year, at which papers were read on the periodical movements of air currents, atmospheric dynamics, the speed of the winds, and the varying temperatures at great altitudes. The previous congresses chiefly discussed the means and methods that might be employed to achieve success; they pointed out the conjectured way; and now that success has come, in a rudimental way at least, it remains to discuss further the evolution to be accomplished and the possible uses of balloons and flying machines. The paramount fact is that in order to be practically efficient the dirigible balloon should attain an inherent or "proper" speed superior to that of ordinary winds. Scientific observations in France have shown that at Paris, at a height of say 300 feet above the Seine River, the probabilities of encountering a wind of less speed than 32 miles an hour are 708 in 1000. That the chances of wind of less than 28 miles an hour are 815 in 1000, so that the possibilities are that a balloon possessing the latter speed could hold its own on 297 occasions, or days of the year. The probabilities of winds less than 45 miles per hour are 963 in 1000.[1] However, the speed of the wind increases rapidly with the height; the registering anenometers on the Eiffel tower having demonstrated

[1] André, "Les Dirigeables," Ch. Beranger. Ed. 1902.

the fact that at a height of 1,000 feet the wind is not infrequently twice as fast as it is at the ground.

The dirigible balloon has now attained a measured speed of 28 miles an hour. Its evolution has taken up over 50 years. Giffard ascended with a spindle-shaped balloon and a steam engine in 1852 and attained 6.71 miles an hour. De Lôme obtained 6.26 miles per hour with power in 1872. Tissandier increased this to 7.82 miles per hour in 1884 with an electric motor, while the next year Renard and Krebs attained 14 miles an hour with the same kind of a motor. Then came Count Zeppelin in 1900 who reached 18 miles an hour, and then the sensational flight of Santos Dumont in 1901 around the Eiffel Tower at 19 miles an hour with a gasoline motor, which he was the first to apply to a dirigible balloon. With the hope of improving upon these achievements the wealthy French sugar refiners, Lebaudy Brothers, authorized their engineer, Mr. H. Julliot, in 1900, to build a new dirigible balloon at their expense. This was first navigated in 1902 and attained 24 miles per hour. Improvements were made in 1903, 1904, and 1905, and in 1906 the perfected "Lebaudy" balloon was given to the French Government for war purposes. The latter at once ordered a duplicate, "La Patrie," with which a speed of 28 miles an hour has been obtained during the current year; and it is stated that a whole fleet of similar dirigibles, five to begin with, has been placed under construction.

Meanwhile the Germans have produced several war dirigible balloons; that of Major Parseval, that of Major Gross, which both have been claimed to exhibit 28 or 30 miles an hour and that of Count Zeppelin, whose immense balloon, rebuilt for the third time, is said by the newspapers to have attained 34 miles an hour. The British Government has also been secretly building a war dirigible balloon at Aldershot. It was first tested September 10 and October 5 of this year, and while perhaps not equal in performance to the French or German airships it constitutes a hopeful beginning.

In the United States the Government has done practically nothing toward building dirigible balloons. This has been left to private initiative and as the only returns possible thus far are from public exhibitions, Mr. Stevens, Mr. Baldwin, and Mr. Knabenshue have built and flown small and slow airships. They could have shown more speed if they had built larger ships, but this was beyond their means, for the "Patrie" is said to have cost $60,000. On the other hand Mr. Wellman has built a very large and moderately fast airship in the daring project to reach the North Pole, and it is earnestly hoped that his third attempt next year will be crowned with success.

It is thus seen that dirigible war balloons have been developed to an inherent speed of 28 to 30 miles per hour. This is not likely to be exceeded very soon, for although the possible speed increases with the size, the danger and difficulties of handling such frail structures increase also. It is probable that the Zeppelin airship, 413 feet long and 38½ feet in diameter, is on the border of impracticability. The present speed, although inferior to that of the flying machine which begins with 38 miles per hour, may prove satisfactory on comparatively still days, but it remains to be ascertained by practice to what height balloons will have to ascend to be reasonably safe from gun fire and what winds will thus be encountered.

The balloon possesses, however, two advantages over the flying machine. First, it can lift a greater proportional or surplus weight with increase of size. If this is not utilized for a more powerful motor, projectiles may be taken up. Mr. Julliot has stated that the "Lebaudy" can carry some 30 bombs, each loaded with 22 pounds of Melenite and that the unbalancing which results from each bomb when thrown overboard can be overcome in 18 seconds by pumping air into the "ballonet" and letting out an equal weight of gas. It remains to be proved how accurate the aim may be. On the other hand, the larger is the flying machine the

more it will weigh in proportion and the less will be the proportional surplus weight. The second advantage is that in a contest between the two the balloon, by discharging ballast, can rise vertically much faster than the flying machine and that the upper position confers great advantage both for attack and defense, as evidenced by all contests between birds. The chief use in war, however, both of the dirigible balloon and of the flying machine will be in scouting and in directing artillery fire by use of wireless telegraphy. They will carry very little surplus weight and their offensive operations will be limited, although occasional lucky shots may prove decisive in their consequences, such as the destruction of a war ship, of a powder magazine, or of a general staff.

Although the United States has done very little toward developing the dirigible balloon it has produced the first practicable flying machine. Maxim in 1894, Ader in 1897, Kress in 1901, and Langley in 1903 (two of them Americans) had experimented with full-sized man-carrying machines but had not obtained satisfactory results. They undertook too much at once, i. e., to work out simultaneously the form of the machine, its equipoise, its motor and its propeller. They were defeated by the lack of equipoise. Their apparatus proved unstable and more critical, still they had no previous experience or practice in handling it. Lilienthal had stated, as early as 1895, that the first problem to be solved was that of equilibrium and control, and that this could only be acquired by experiment and practice. His advice was followed by Pilcher and by Chanute and subsequently by Wilbur and Orville Wright, of Dayton, Ohio, whose improvements have led to success. After three years of experiments with gliding machines, they added a motor and a propeller of their own design in 1903, and were enabled on the 17th of December to make four flights with their dynamic flying machine, the longest being 852 feet in length against an icy, gusty wind blowing at 20 miles an hour. They greatly improved upon this in 1904 and finally perfected an apparatus which flew, in 1905, 24 miles on a stretch at 38 miles per hour.

When first these achievements were made known in December, 1905, there was general incredulity. It did not seem possible that a problem which had baffled mankind for six thousand years should have been solved while the public had no premonitory information of impending success. It was presently discovered that there had been preliminary successes for two years by these two gifted mechanicians, but that the performances had been kept secret for fear that the construction and operation of the machine should be copied by other searchers and that the inventors should lose their reward. Investigation established the truth of their claims, these are now generally conceded, and a swarm of inventors (some thirty or forty in Europe, most of them in France), at once engaged in attempts to imitate the feat.

The first in point of date was Mr. Vuia, a French inventor, who experimented his No. 1 machine in February, 1906. He was the first to show that an aeroplane flying apparatus could rise upon the air by running upon wheels (four in this case) upon an ordinary road. The machine rose a score of times and flew a few feet, but almost invariably was broken in alighting. Mr. Vuia built his No. 2 machine in 1907, and tested it in June and July. He rose to a height of 16 feet and flew some 65 feet, but the stability proved defective and the apparatus fell and was broken. Mr. Vuia was only slightly bruised.

The next to get ready was Mr. Santos Dumont, of balloon and Eiffel Tower fame. With his No. XIV bis., an aeroplane on wheels and 50-horsepower motor, he made a flight of 200 feet on the 23d of October, 1906, and of 723 feet on the 1st of November, this being to the present time the longest flight on record save those of the Wrights. On both occasions the apparatus was injured in alighting, and then No. XV was built, which was broken on its first public trial, March 27, 1907. Then the repaired XIV bis. was tried April 4, and broken. Then No. XVI was produced, this being a mixed apparatus comprising a spindle-shaped balloon and an areoplane, the whole mounted on wheels. This was tested June 8, but was

unfortunately wrecked on the first trial. He has now built another apparatus with 100-horsepower.

Meanwhile Mr. Delagrange, a French sculptor, had an aeroplane built with a 50-horsepower motor mounted on three wheels. It was first tested in February, 1907. It was broken and mended several times, and after a number of trials a flight of 200 feet was obtained March 30 and of 164 feet April 8, the apparatus being again broken. Mr. Delagrange then joined Mr. Archdeacon and the two have had built a modified apparatus, which, after some preliminary experiments over water, is to be soon tested over land.

Mr. L. Bleriot, an able French engineer, has had built by Mr. Voisin no less than three types of flying machines on wheels. The first was like a Hargrave kite and gave unsatisfactory results, the next was a monoplane, shaped like the winged seed of the maple. It was tested April 5, 7, 15 and 19, broken and abandoned, and the third essentially a Langley aeroplane, mounted upon three wheels and provided with a motor of 24-horsepower, since superceded by one of 50-horsepower. It was tested on July 7, 11, 15, 25, and 31 and on August 6 and 10, the longest flight being of 469 feet, and breakages generally resulting at each trial. Finally on 17th of September, after making a flight of about 150 yards, it pitched down from a height of nearly 50 feet and was smashed. Mr. Blériot had his face badly cut and was bleeding profusely when he was rescued from under the débris. His injuries, however, were, happily, not serious.

Thus it is seen that the flights thus far have consisted of little more than grasshopper-like jumps and that almost every trial has resulted in mishaps and breakages. Yet the inventors are undoubtedly learning. They have been plucky; they have mended and altered their machines time and again, and they may after a while acquire the science of the bird. Fortunately no lives have been lost or serious injuries sustained, and so other French inventors are prepairing to try machines which they have completed. Mention may be made of Captain Ferber, who has an aeroplane equipped with a motor of 100-horsepower, Mr. Kapferer, Mr. Farman, Count de la Vaux, Mr. Esnault Pelterie, Mr. Seux, Mr. Barlatier, while in England the government has built, in great secrecy, an aeroplane machine which is now ready for testing in a secluded spot in the Highlands, and four or five aviators have built flying machines of their own. Moreover, in France, in Germany, in Austria, in Denmark, and in Switzerland there are over a score of other aviators whose names have been published as having flying machines under construction with which to tempt fate. There is no telling what are their chances of success. The whole of the civilized world, so to speak, is in expectance and it is understood that Wright Brothers are in Europe negotiating with various war departments for a sale of their secrets.

Now that the air is to be navigated the study of meteorology becomes more important than ever before.

Activity in the exploration of the upper air for meteorological purposes has been manifest in various quarters of the globe. In Germany, kite and balloon observations have been made continuously at Lindenberg since 1902. In France, under the direction of M. Teisserenc de Bort, the well-known work with sounding balloons at Trappes has been continued. At the beginning of the present year an expedition was sent by the French Meteorological Service to Swedish Lapland, within the Arctic Circle. Although the surface temperatures at this far northern station were much lower than at Trappes, the upper air conditions within the Arctic Circle confirmed, in a remarkable manner, the results obtained at Trappes in France.

In a joint investigation of the upper air conditions in the trade wind region of the Atlantic, in the vicinity of the Azores, Madeira, and Cape Verde islands, M. Teisserenc de Bort and Prof. A. Lawrence Rotch, of Blue Hill Observatory, Hyde Park, Mass., established the existence of the traditional counter trades. These investigators have shown that the vertical sequence in the air currents near Ascension,

south of the equator is:—Trade winds from the southeast; diverse winds from the southwest; counter trades from the north. North of the equator, as in the vicinity of the Azores, the winds of the lower strata blow from northeast and east; above 3,000 feet, as a rule, from northwest to northeast.

The United States Weather Bureau at its observatory on Mount Weather, Va., began the systematic exploration of the upper air with kites, on June 20 of the present year. Since that time ascents ranging from one to four miles above the station have been made daily, except on Sundays and on holidays. On October 3d, 1907, an altitude of 23,111 feet above sea level, or a little over four miles above the station, was reached, this being, so far as known, the greatest elevation hitherto reached with kites. At the above-named height the temperature was found to be 5.4° F. below zero. The details of this remarkable flight will be communicated to the Congress by Dr. Wm. R. Blair of the Mount Weather staff.

The valuable information secured by the kite observations is telegraphed daily to the Central Office of the Weather Bureau in Washington, and is there used in the forecast service for the Middle Atlantic and New England States.

Meteorological stations on Pikes Peak and on Mount Washington, in the United States, and on Ben Nevis, in Scotland, have been abandoned, especially as the data secured at those places were found to be of little or no use in the making of weather forecasts largely because of the disturbing influence of the radiation from the mountain itself; but, now that the kite has been developed to such a high state of efficiency that at Mount Weather but one observation was missed in three months, it will be possible to reopen these stations and get readings of instruments far above the peaks, which will be more useful to the weather forecaster than any surface observations.

In other parts of the world much valuable work has been done and unexpected facts have been brought to light, especially by the flights of unmanned balloons, which have ascended 7 to 9 miles above the earth's surface.

It is evident that the first application in aerial navigation will be the art of war, and it is clear that its main usefulness will be in reconnaissance, for the loads which can be carried will be small. Balloons have now reached nearly their limit of speed and will always be comparatively slow. Flying Machines begin with 38 miles an hour and may attain in future 60 to 75 miles an hour, with a radius of action perhaps 200 or 300 miles. It is now interesting to speculate as to what further uses may grow out of these powers and what the development is likely to be. Commercially very little is to be expected from either balloons or flying machines. Carrying freight is out of the question and even profitable smuggling is doubtful. For passenger traffic the number carried will be so small and the cost so great that no competition is possible with existing modes of transit. Moreover, there will always be danger, but even before this has been minimized aerial navigation may serve in sport. This has already occurred with balloons and will be more pronounced with flying machines. The latter will be useful in explorations of otherwise inaccessible places, such as mountain tops, swamps, or densely wooded regions, and also in rapid surveys of desert or insalubrious stretches, provided that supplies of petrol can be obtained within the radius of action; for the petrol motor alone has made aerial navigation possible and is the *sine qua non* of its success.

Balloons and flying machines will undoubtedly be used in carrying dispatches and even mail service may be attempted but deliveries will be irregular. If the wind blows from the right direction the speed may be great, but if it blows the wrong way the trip may be long. Upon the whole, now that success has come, we see that the conquest of the air has more limited practical uses than was imagined when it was not known how that success was to be achieved, but it may develop new uses of its own and prove an important benefit to mankind.

The Voyage of the America, By J. C. McCoy, Pilot.

We cannot say too much in praise of the preparation and the plans which were carried out so successfully in St. Louis by the Committee in charge, under the direction of the Business Men's League of St. Louis. Everything went off in the most approved style and quite equal to any contests that I know of that have been handled abroad. As the appointed hour approached, 4 o'clock, we found that every balloon was prepared, thanks to the able manner in which the inflation of the nine balloons was managed and every balloon left the ground directly on the minute. The gas furnished by the St. Louis people proved to be the very best quality of coal gas for ascensional force; there could not have been better stability than the gas furnished us at this time. I have not had an opportunity to talk with the other pilots, but no doubt they will agree with me with regard to it. We are also under very great obligation to the weather reports furnished us which I found almost invaluable to us in our work in the air. There were given to us by the Weather Bureau forecasts of weather which might affect the balloons. They were handed to us on the ground just before our departure. I do not think a race has ever been held before where such full observations regarding the conditions of the air were known.

So far as our own work was concerned, I was accompanied by Captain Chandler. We had a very fortunate start. I located my balloon 300 feet above the ground until darkness came on. This gave me a good opportunity to observe the drift of the wind as affecting those higher in the air. The haze and smoke was very great and the other balloons were obscured. Those which had risen to a considerable height we were able to see because they were well above the smoke of St. Louis. I never saw Major Hersey's balloon until well up in the air. He was about three or four balloons ahead of mine in arising. We traveled a very little west of north the first part of our trip, but later in the evening the current carried us more to the north toward Lake Michigan. We never got west of the Illinois River. As morning approached, in the early morning, we located ourselves at Grafton, Illinois, traveling in the direction of Lake Michigan, but a change of the wind in the early hours brought us more easterly, and at six o'clock, at 1200 metres above the earth, traveling almost east, which direction we were able to keep all the day. At that time there was a strong northeasterly current near the ground, but at 1200 metres the current was south of east and we made this easterly current which was about only 600 metres thick. We kept ourselves in this current until four or five o'clock, but coming nearer to the ground we lost the current and were unable to locate ourselves in it again, owing to loss of gas. The condition of our balloon at this time, losing some amount of gas, made it difficult for me to obtain a permanent equilibrium except at about 1200 metres. Of course we were practically not gaining a foot, simply traveling on the arc of a great circle equally distant from St. Louis and very discouraging.

That night about 12 o'clock we crossed the Allegheny River in the vicinity of Wheeling and entered into the coke regions of Pennsylvania. The whole earth was lighted up by the coal industries and looked as if we were looking down into the infernal regions. We doubted very much the necessity of making descent in that region. It was very thrilling, that sight. During the night we approached the mountains and our altitude was necessarily much greater. We went up somewhere in the neighborhood of 3,000 metres. Heavy storm clouds came up below us and the cold became intense. The temperature was below freezing, though I do not remember the exact figures. It made quite an impression on us, though, you may be sure. The balloon would make great sweeps to the earth and drop sometimes as much as a thousand metres. The first thing in the morning, as soon as the daylight appeared and we were able to see, the clouds had disappeared and we identified Harper's Ferry and we were quite rejoiced to think that we would be able to make a landing at Washington. The landing from St. Louis to Wash-

ington had been discussed and we were quite enthusiastic about landing at Washington, but second thoughts suggested the wisdom of not coming down at Washington but continuing our journey as far as circumstances would permit. As we were traveling at that time due east we soon saw the waters of Chesapeake Bay and decided to make our descent as near the shore of Chesapeake Bay as would be advisable. At the ground, we found a very strong wind blowing. We thought it was blowing about 40 miles an hour. The situation was critical to us. We had left without an anchor and I was somewhat concerned as to how we were to get down. I told Captain Chandler he would hit as hard a bump as he ever had in his life. He said, "Go ahead, I can stand as much as you can." We got nearer and nearer and the attacks of our guide rope which we had let down were, perhaps, as vicious as anything could possibly be on earth. It got caught on a rail fence and it made nothing of that rail fence. It simply picked it up clean. Once it got caught in the top of a tree and I told the Captain he would have to hold on tight, and it brought that balloon up! you can imagine a motor traveling 30 or 40 miles an hour and coming in contact with an obstruction. Well, it brought our balloon up very quickly, although fortunately we suffered no real injury. Fortunately, also, the top of the tree came away with a horrible crash and the guide rope let go. I gradually brought the balloon down to where the guide rope was spread out over a great surface of the forest, so I thought I would prepare to light at the edge of the forest. Just before reaching the edge I held the valve and the balloon settled down between the trees as softly and gently as ever a balloon could.

THE VOYAGE OF THE ISLE DE FRANCE.

By Alfred Leblanc.

In starting, the wind was towards the west, and we were hoping to make a voyage into Canada, but the wind changed directly towards the northeast, and we then expected to reach the Coast. We did reach the Coast, in New Jersey, but we still hoped to continue, and so land on Long Island, but the wind drove us back, and we were obliged to land somewhere near the place where the German balloon landed, though at that time we did not know the German balloon was so near, or we might have made some effort to pursue the voyage further. The landing was very easy and the whole voyage resembled very much a trip over the plains of Europe, the most interesting portion of the trip being the crossing of the Alleghanies, which presented some novel features.

NOTES OF A RUSSIAN MILITARY AERONAUT ON THE APPLICATION OF BALLOONING TO LAND AND NAVAL WARFARE.

By Lieut.-Col. F. A. Postnikov.

The first practical application of ballooning to military purposes took place during the French Revolution when the Republican army had the possibility, during the siege of Maubeige, to observe the effect of its artillery on the besieged city, thanks to the energy and enterprising spirit of Coutel, and was thus enabled to rapidly take possession of this fortress. This was at the end of the 18th Century. Up to the Franco-Prussian War no more or less serious adaptation of aeronautics to the armed struggle between nations can be quoted during the entire lengthy period preceding it. During one year only of this war more practical applications of ballooning were made than during the whole intervening time. Paris, cut off from the world in general and from France in particular by the iron ring of German troops, took extensive advantage of aerial means of communication which the German army was incapable of breaking. During this siege sixty-four balloons flew out of Paris taking along from the besieged city its mail and carrier pigeons for the receipt of news from

without. Thus 3,000,000 letters were sent and forwarded to their destination. This war proved to the entire world the importance and necessity of the adaptation of this new fighting means in fortress warfare and we see that in all European countries the creation of balloon sections and the establishment of schools for the preparation of experienced aeronauts, as the school of Moudon in France, that of Berlin in Germany, and of St. Petersburg in Russia. In all more or less important fortresses of Austria, Germany, France and Russia were organized fortress balloon companies consisting in the average of two officers and 100 rank and file, and supplied with material in sufficient quantity as to be able, in time of war, to furnish a threefold contingent.

It may be easily understood that balloon parks, projected for action in fortresses, were encumbered by apparata and material of great weight, as these were to be moved over small distances and on excellent fortress roads. But the colonial wars, as that of the French in Tonkin and the British in South Africa, waged in countries with bad roads and far from manufacturing centres, showed the necessity of creating light mobile balloon parks adaptable for field warfare. The foundation of field balloon parks was thus laid. Their usefulness, however, was recognized only by a small number of specialists and was greatly contended by many military authorities.

The Russo-Japanese War, which radically changed the views of military authorities on the methods of waging modern warfare, also showed the necessity of applying field balloon detachments not only to fortress but also to field warfare. With the enormous armies of the present time and with the great range of modern artillery fire, military operations being pursued covertly, cavalry reconnaissance, especially on broken terrain, becomes very difficult and, in some cases, absolutely impossible. The balloon, on the contrary, possessing an enormous horizon and being almost invulnerable to hostile shots, has its field of action continually increasing in reconnaissance and in transmission of orders at the same time to all detachments, operating at enormous distances from each other, by means of preconcerted signalling. Neither belligerents at the beginning of the Russo-Japanese War had organized balloon detachments, and therefore none of them could profit by the advantages which could be derived from the existence of trained field balloon detachments, and both sides hurriedly endeavored to improvise from the means on hand detachments of this new arm. The Japanese during the investment of Port Arthur succeeded only towards the end of the siege to create a balloon park, the material of which was far from perfect, evidently on account of the lack of technically competent officers in this branch of the service. The Russians, who had sent to the theater of war one fortress balloon section, soon appreciated the unwieldiness and inconvenience of fortress material operating on the bad roads of Manchuria. In the beginning of 1905, the Russians organized four balloon companies and introduced in these detachments a completely new process of obtaining hydrogen with the aid of aluminum. This allowed them to have material in field parks several times lighter than that of fortress detachments. Unfortunately for ballooning, the revolutionary movement in Russia and the conclusion of peace with Japan brought about by it, did not allow the test of the practicability of these detachments in serious operations and during a sufficiently lengthy period of time.

During the same war, balloons were for the first time applied in naval defense. The idea of adapting balloons to naval warfare had existed for some time and experiments were even made in France of balloon ascensions from the deck of men-of-war and flights above the surface of the sea for the purpose of maintaining communication with conveying vessels. Observations, made from balloons on the sea, give the following advantages to the commander of the squadron making them: instead of ordinary radius of observation of twelve miles, the modern balloon gives a radius of sixty miles and the balloon does not divulge the presence of the squadron, as approximately at the distance of 12 miles it is invisible to the hostile observer even in clear, sunny weather, and, moreover, it renders it possible to see objects

under the water, such as mines and submarines, which are absolutely impossible to detect from the deck of a vessel.

The first practical application of balloons in naval warfare was made in Vladivostok after one destroyer and one cruiser of the Vladivostok squadron had been damaged by Japanese mines, of which an enormous quantity was strewn around the port of this city. At the request of Admiral Yessen a balloon detachment was formed under command of the military engineer Postnikov. It was composed, in the beginning, of one officer and twenty sailors and later, in view of excellent results achieved, it was increased to four officers and 120 sailors performing balloon guard service around Vladivostok and sometimes reconnoitering the banks of Japan with the squadron of Admiral Yessen. During the almost daily activity of this detachment numerous valuable observations and experiments were made with regard to the various shapes of balloons, the stability of various balloons with various velocities of the wind, the degree of visibility of submarine mines of various colors, the possible range of observation under various conditions of weather and illumination by the sun, as well as the practicability and successfulness of various means of obtaining hydrogen. The latter was obtained by means of three processes—the old way by means of acids, the new mode by means of aluminum and also by electrolysis, for which even an electrolytic plant had been constructed which manufactured hydrogen of excellent quality. It was kept in a compressed shape in steel tubes under a pressure of 200 atmospheres. The evident usefulness of balloons in naval warfare induced the Russian Government to look favorably upon the offer of Count Stroganov, amounting to 1,000,000 roubles, destined for the purchase of a cruiser specially adapted for ballooning. A fast passenger steamer was bought for this purpose in Germany and reconstructed so as to present a floating plant for the obtaining of hydrogen, and a depot and barracks for the balloon detachment. This steamer was, according to the project, to join the squadron of Admiral Rojestvenski in the vicinity of Madagascar, but the reconstruction lasted so long that it had only reached the banks of Spain when news was received that Admiral Rojestvenski had entered the waters of the Pacific Ocean and it was decided that this balloon cruiser "Russ" should return to the Baltic Sea.

AEROLOGY IN GERMANY.

By Dr. Reinhard Süring.

For about twenty years Germany has been greatly occupied, almost more than any other country, in the study of the physics of the upper atmosphere. Several circumstances have favored the progress of these investigations. The zeal and the ability of experts, first of all Assmann and Berson, Hergesell, Köppen,—the aid of the government and last but not least the personal interest of the German emperor in all aeronautical questions, combined to advance scientific ideas and plans with the greatest rapidity. The study of the physics of the free atmosphere has become a special branch of science, and only this branch will be discussed here.*

Three things especially are noteworthy about the German methods for the study of aeronautical physics: First, the successful attempts to observe systematically and exactly the meteorological elements at great heights, in order to gain a meteorology and climatology of the upper atmosphere in addition to that of the surface of the earth; second, the active participation in expeditions, especially in marine ones; and, last, the refined experiments for improving instruments and methods. The results of these endeavors appear in admirable scientific papers.

The founder of modern aeronautical science in Germany is Dr. Assmann and

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*For this the name "Aerology" was proposed at the International Conference held last year.—*Editor.*

to his energy we owe the first government observatory, which was built near Berlin in 1899. Here the meteorological conditions at some distance above the earth by means of kites and balloons were recorded as frequently as possible. As to kite-ascents the work at the Blue Hill Observatory of Professor Rotch was used as a model, but in order to effect ascents in any kind of weather much additional work had to be done. The methods and the results appear in the *"Ergebnisse"* of the Aeronautical Observatory, four large volumes of which have been hitherto published. The observatory, which was removed in 1905 from Berlin to Lindenberg, near Beeskow, 60 kilometers eastward, has succeeded in making daily ascents with kites or captive balloons for nearly five years without any interruption. In this way valuable material has been gathered so that we are now well informed about the conditions of temperature and wind up to at least a height of two miles. A great number of the ascents have even attained a far greater height; and the record in high kite-ascents (20,000 feet) was reached here last year.** The example of the Prussian Government was soon followed by the German "Seewarte" at Hamburg. A small aeronautical station was established there, but as it uses only kites—only very rarely pilot balloons—daily ascents are not feasible. Besides the work at these observatories, special ascents with pilot-balloons are likewise undertaken at the meteorological institutes in Strassburg and Munich.

For kite-ascents high speed steamers are of great use as they can modify the wind artificially in order to lift kites in light winds or to prevent breaking the wire in stormy weather. But while this method had previously been used on voyages only*** progress is being made in Germany by building "floating observatories." The initial one will be inaugurated this year on Lake Constance in Southern Germany where Count Zeppelin also makes trials of his dirigible balloon; and it is intended to erect a similar observatory on the coast of the Baltic Sea, near Danzig.

The technical experience gained in aeronautical and meteorological experiments suggested trying ascents in regions of interest abroad. First of all we must mention the cruises of Professor Hergesell, on the yacht of the Prince of Monaco in the Mediterranean above the regions of trade-winds, and also in high northern latitudes. It was a feature on these expeditions that they not only made use of kites but also of pilot-balloons, for at small heights the former frequently met with calms and then could not rise higher, while balloons used in tandem succeeded in gaining elevations of many thousands of feet. Two closed balloons tied together were sent up, one of which exploded and the other, bearing the instruments, sank slowly until they were supported on the ocean by a "floater."**** Last year Prof. Hergesell at 80° N. Lat. sent his balloons up to 25,000 feet. Some astonishing results were reached by these expeditions during the summer months. For instance, there was found an unexpectedly warm temperature at considerable heights above the Arctic Ocean, evidently produced by direct heating by the ever-shining arctic sun. On the other hand Professor Hergesell was able to show that near the Norwegian shores the heating of the atmosphere by the Gulf Stream only extended upward a few hundred feet. Further remarkable progress has been made by the German navy in furnishing her surveying vessels with apparatus for aeronautical research. In the beginning of this year H. M. S. "Planet," the first vessel thus equipped, returned from a voyage along the western shores of Africa, then penetrating to about 50° South and returning by the Pacific and Indian Oceans. A second ship, H. M. S. *Möve*, has explored the atmosphere this summer between Norway

**A height of 23,000 feet was reached at the Mt. Weather station of the U. S. Weather Bureau in October, 1907.—*Editor.*

***The first experiments were made by Professor Rotch in 1901 from a tugboat in Massachusetts Bay and also on a transatlantic steamer.—*Editor.*

****Kites and registration balloons were also used by the expeditions sent in 1905 and 1906 to the North and South Atlantic by Messrs. Teisserenc de Bort and Rotch.—*Editor.*

and Iceland. At the same time ascents were made by Professor Hergesell near Spitzbergen as well as by a private expedition, conducted by Captain Hildebrandt between Iceland and the Azores.

Finally we must mention the endeavor to improve instruments for aeronautical research. For manned balloons Assmann's aspiration-psychrometer has been prescribed as a normal instrument by the International Aeronautical Committee. Also for kites we have had for some time past exact instruments, for instance those of Marvin, yet the registrations of the apparatus of pilot-balloons were unreliable until lately. But the recent investigations in the compensation of aneroid barometers (Hergesell and Kleinschmidt), in the sluggishness of thermometers (Hergesell, de Quervain, Maurer) and of hygrometers (Kleinschmidt), have shown us exactly the errors of these instruments. We must also mention especially among many others, the following investigations: The methods for pursuing pilot-balloons and thus studying the movements in the upper atmosphere by means of theodolites (de Quervain, von Bassus); the methods for finding the position of the balloons by surveying instruments (Marcuse, Wegener); and the studies in atmospheric electricity by Prof. Ebert in Munich.

It is a matter of course that with such valuable auxiliaries all questions of the physics of the free atmosphere are being greatly promoted. We need only recall the studies to explain the warm layers of the atmosphere at a height of 30,000 to 40,000 feet, discovered by Assmann and Teisserenc de Bort; the investigation of the circulation between areas of high and low pressure; the formation of strata and waves in the atmosphere; the differences between different latitudes; between land and sea, etc. It is earnestly to be hoped that Germany will continue to take a chief part in the international endeavor to solve all these important questions.

LIGHT ENGINES.

By Walter L. Brock.

I have read with interest the article and letter of Mr. Harry E. Dey and Mr. Roger B. Whitman respectively, and being interested in the production of light motors thought I would add my mite to the discussion.

Light weight and fuel economy seem to be the special requirements to be met, together with reliability and suitable durability. The relative value of light weight and fuel economy would seem to depend on the particular conditions of use. Thus, for flights of short duration, the motor weight would be the predominating factor, but as the distance is increased the weight of fuel would become a larger factor, and for very long flights would become so important as to permit the addition of considerable weight to the engine, if such addition would cause a greater saving in the weight of fuel carried. For the present the motor weight is the most important factor.

Light weight per horsepower may be obtained by increasing the power output of a given size engine and by decreasing the weight of construction. The power developed by a given size engine depends on the Mean Effective Pressure in the cylinder and the Revolutions per Minute of the engine.

To obtain a high M. E. P. the maximum possible weight of the charge should be introduced into the cylinder, compressed as highly as permissable, ignited at the proper point, expanded with little loss of heat to the surrounding walls, and exhausted with a minimum back pressure. As the speed of an engine is increased the weight of the charge decreases, due to the increased resistance of the valves which lower the pressure on the suction stroke and raise it on the exhaust. The result is, that for any particular engine there is a certain speed at which the product of the M. E. P. and R. P. M. is a maximum, thus giving the greatest power output.

Large valves, properly timed, thus constitute an important element in the design. The automatic inlet valve has considerable lag in opening and in closing if the valve be of any size, due to its inertia. A stiff spring helps the closing but increases the resistance to the entrance of the charge. As the automatic inlet valve is not very reliable and since with a suitable arrangement an extra spring is the only additional part required to enable it to be operated mechanically, it would appear to be poor practice. In fact, one would be justified in adding considerable weight to the engine for the sake of obtaining the increase in power obtainable through the use of mechanically operated valves.

That increasing the compression increases the power can be shown both theoretically and practically. The increase is most noticeable in high speed engines, as a small clearance enables the functions of the exhaust and suction strokes to be carried out more thoroughly. The combustion of the charge takes place more rapidly when the charge is highly compressed, which is very desirable, the time required for combustion being much longer than is commonly supposed. Ignition should take place at the proper time on each compression stroke. Whether produced spontaneously or by spark makes little difference, providing it is not too early. It is best, however, to avoid it by a good margin, as it is rather irregular in time of occurrence. Whether ignition should be by jump spark with non-vibrator coil, or by make and break is a question which may never be decided. Vibrator coils are not suitable for high speed engines, as the variation in point of ignition is too great, due to the slowness of the vibrator. 400 vibrations per second is the highest any vibrator has been known to work.* If the engine were running at 2,400 r. p. m. there would be a possible variation of 36 in the point of ignition. Light weight magnetos or dynamos will undoubtedly be produced as batteries of any type are either very heavy or have little capacity. High speed engines with a large number of cylinders require a good deal of current.

When only the expansion stroke is taken into consideration it would seem that the cylinder should be kept as hot as it can stand. The suction and compression strokes are best carried out in a cool cylinder. The hotter the cylinder the less the weight of the charge admitted on the suction stroke due to its being heated and expanded upon entering. A hot cylinder also increases the work of compression and the danger of preignition. Tests show that when running with full load the cylinder should be quite cool, even in water cooled if the maximum power and economy are to be obtained. With high loads the cylinder should be much hotter to obtain good economy. Since cooling effect is obtained at the expense of weight or power a low temperature may not be desirable. The conditions in an airship being very favorable for the air-cooled engine, it will not be easily displaced by a more complex system of cooling.

High speeds enable one to increase the out-put of an engine considerably. How far it may be carried depends upon the design and lubrication of the engine. Since very high speeds are obtained at the expense of a large increase in the amount of lubricating oil used and of fuel economy the speed eventually used may be quite moderate.

Light construction is a matter of design and experiment. The very strong, durable materials produced for the auto enable small factors of safety to be used while by going to the expense of machinering it out much weight may be removed where it is not required but is usually left. Since cast iron is the weakest and least reliable form of iron its use will probably disappear in spite of its excellent wearing and heat resisting qualities. Pistons may be made of cast steel or pressed from a mild steel. The cylinders may be cast steel or machined from tubes or forgings. The present difficulty due to warping will undoubtedly be overcome.

Various types of engines are being developed to reduce weight. The general tendency being to increase the number of cylinders for each crank-pin, thereby re-

*Vibrators have been known to attain 800 per second.—Ed.

ducing the weight of the crank-case and crank-shaft. While two cylinders per crank-pin is the usual practice as many as five have been used. The latter represents about the practical limit. Enough cylinders should be used to avoid a fly-wheel (about six) while how many more are used will depend largely on the power of the engine as it does not pay to increase the size of the cylinders above a certain point. This is due to the fact that the allowable piston speed does not increase much as the stroke is increased and a short stroke is not suitable in many ways for large diameters.

In as much as the two-cycle engine in some of its forms offers superior inducements in regard to light weight and fuel economy it is safe to say that this much abused type of engine will become a strong contender for primer honors. The long neglected Brayton cycle may also be developed.

THE DEVELOPMENT OF AN AEROPLANE

By L. J. Lesh.

Summing up my experiments for this Summer in a few words, I have accomplished the following results.

About fifty flights have been made, one over water and the rest over land. The towing agent in the flight over water was a fast motor boat; over land a horse has supplied the pull necessary for support.

The longest flight was made over the river St. Lawrence, the distance from the starting point to where I finally touched the water being six miles. The flights over land have ranged in length from two hundred feet to about half a mile. The greatest height reached during the experiments was nearly seventy-five feet, during a flight over land.

The longest period of suspension in the air was about twenty-four minutes, during the flight over the river. The flights over land averaged a quarter of a mile in length and lasted about sixty seconds. Thus it will be seen that I have covered about eighteen miles during all the flights and that the total time spent in the air has been considerably less than an hour and a half.

I have experimented with two machines the specifications of which are as follows:

Area of supporting surfaces	240 sq. ft	175 sq. ft
Weight	60 lbs.	50 lbs.
Length of wings, tip to tip	22 ft.	16 ft.
Width of main surfaces	6 ft.	6 ft.
Height of machine	4 ft.	4 ft.
Curvature of surfaces	one in seven	one in twelve
Material of framework	chiefly 7/8 inch round spruce rods.	
Joints	Steel bolts and steel tubing.	
Cloth covering of surfaces	Unbleached muslin, unvarnished.	

Strange as it may seem, when one takes into consideration the difference in lifting, surface, both of my machines seemed to require about the same speed through the air for support. The length of the preliminary run was about the same and the smaller machine did not seem to have any greater speed at the moment of landing than the larger apparatus.

In experimenting with a towing line I have found that it is not necessary to make the start directly into the wind and that landings can be made safely with the wind blowing from the side if care is taken to prevent the wings from inclining at too steep an angle of incidence. The framework is very liable to be broken if the surfaces are not tilted forward to horizontal at the moment of landing.

It is quite impossible to quarter into the wind and keep the wings from tilting laterally by the use of a rear vertical rudder alone. Either the operator must shift his center of gravity as the center of pressure moves up the ascending wing, or the disturbance must be overcome by the use of a certain system of forward rudders. I

have succeeded in quartering into the wind at a height of only about eight feet, with the wings parallel to the ground. Steering and balancing was accomplished in the first machine by shifting my weight and in the second machine by manipulation of the forward and rear rudders.

I have tried to adjust the bridle of my machine so that the resultant pull, or rather resultant of the distributed pull, comes at the point to which I hope to attach the propeller. I have chosen to attach the main line to the machine by a bridle because in this way the pull is made to come constantly from the same angle while if the towing rope were attached directly to the machine the latter might quarter into the wind at one angle and the rope might point off in another direction. Of course in a motor machine the line of effort of the propeller (line produced outward from the crank-shaft) would remain constant and I wished to operate under these conditions in my preliminary flights.

THE START "IN NO. 2."

The similarity between motor and towing flight becomes more and more apparent as one enters into a careful study of the two. Gliding flight at small angles of descent certainly provides the best possible training for an experimenter who has in mind the development of a motorless soaring machine, but the value of this kind of work to a prospective "motor aeroplanist" looks doubtful. A soaring machine would certainly provide great sport but the difficulties to be met in accomplishing the feat look insurmountable at present.

Of course it might be possible to soar indefinitely on the side of a hill, but to perform the real thing one would have to rise in towing flight to a height of several hundred feet and then either fly along until an ascending column of air was met or cut loose and glide towards a spot where such a phenomenon was known to exist.

It seems to me that the feat of soaring had better be postponed for a time until more is learned of the trend of wind currents and the management of dynamic machines at great heights.

In conclusion, I wish to acknowledge my debt of gratitude to Mr. Octave Chanute, whose kind assistance made this undertaking possible in the first place and whose sound advice has greatly facilitated the carrying out of my plans.

CHRONOLOGY OF PRINCIPAL EVENTS.

Oct. 1. Test is made of the apparatus for changing the elevation of the Zeppelin dirigible by means of a 220-pound lead weight which is moved forward and backward on a rod. Within a period of twenty minutes the height was changed from 165 feet to above 1,000 and back again to 165 feet without loss of gas or ballast. On September 30th a flight lasting 9¼ hours, corrected figures, was made, the distance covered being about 200 miles. The wind was stronger than in any previous test but the ship encountered no difficulty and the speed was estimated at 30 miles an hour.

Oct. 3. The highest altitude ever reached by a kite in the United States is recorded by Professor A. J. Henry at the Mt. Weather Observatory who sent a kite up to 23,000 feet. The temperature at that height was 5 degrees below zero.

Oct. 5. English Dirigible No. 1 sails from Farnborough to London, a distance of 35 miles, manoeuvreing over the city and landing on the outskirts. The flight lasted 2½ hours. Disappointment felt at the inability to return and the conclusion is reached that the ship is practical only in favorable weather. Average speed in this trip, 24 miles going with an 8-mile wind. Envelope holds 54,000 cu. ft. of hydrogen.

Oct. 8. Zeppelin manoeuvres over Lake Constance and the nearby mountains, remaining 1¾ hours in the air. Count Zeppelin denies the story that he has sold his ship to the German Government but admits they have purchased his shed. This is the last time, it is reported, this model will be taken out.

Oct. 10. The German military balloon makes two very successful ascents, sailing over Berlin and Charlottenburg, staying in the air 2½ hours.

Oct. 10. High wind tears the English Dirigible No. 1 loose from its moorings. The lower frames were smashed and the ship is all but a total wreck.

Oct. 10. Henry Deutsch offers his dirigible La Ville de Paris to the war office of France to be used for national defense.

Oct. 11. The German military dirigible flies from Tegel six miles to Berlin and returns under cover of night. With the falling of the dew the ship came close to earth and the gathering crowd in the streets was dispersed by a shower of water ballast.

Oct. 12. The Daily Graphic mammoth balloon leaves Crystal Palace, London, in an unsuccessful attempt to break la Vaulx's distance record. The balloon crossed the North Sea to Denmark and travelled over Scandinavia with great speed. The bearings were lost in a fog and a descent made at Brocha, Sweden, at 1:30 p. m., Sunday, October 13. The distance made, 603 miles covered in 19 hours. The flight, however, is remarkable as it is the longest cross-channel trip yet made. Thinking a large lake was the open sea the aeronauts hastily slid down the guide rope and left the balloon to shift for itself. It was afterward recovered, somewhat damaged. The balloon has a capacity of 107,963 cubic feet and lifts two tons weight. The diameter is 59 feet. This is the largest balloon now in use.

Oct. 15. Henry Farman makes a flight of 935 feet, breaking the Santos-Dumont-World's record of 723 feet, at a speed of 25 miles an hour. The landing was made without a mishap, except to bend one of the wheels slightly. He maintained perfect equilibrium and had complete control of the machine. After a few preliminary runs against a fresh breeze the 50 horse-power motor was started at full speed. After a run of about 300 feet the front rudder was raised to a slight angle and the apparatus immediately rose into the air to a height of about 36 feet, maintaining that height throughout almost the entire distance. In speaking of his flight, Mr. Farman said: "By what I did to-day I am convinced I can fly a mile or more without the slightest difficulty. The machine obeyed the rudder perfectly and throughout the flight I had it in complete control."

Oct. 22. Esnault Pelterie makes a series of flights of from 300 to 500 feet in length, turning to avoid obstacles, rising and descending. The machine resembles a butterfly to the lay observer, with movable curved wings inclined by levers. At the tips of the wings, which have 161 square feet of surface, are small wheels to prevent damage in case they strike the earth. A seven cylinder motor of 25 horse-power, weighing 96.8 pounds, furnishes the power, starting at the first turn. A 4-bladed propeller is used and the total weight, with operator, is 528 pounds.

Oct. 23. Farman makes half a dozen flights at Issy. A new propeller of larger diameter has been fitted. Almost as soon as the engine was started the machine left the ground and at an altitude of from 6 to 18 feet flew a distance of 620 feet in 15 2-5 seconds. The usual rolling motion of an aeroplane was noticeably absent.

In the second trial it was necessary to change the course to avoid a standing automobile and as the chance of making a long flight was gone the motor was stopped and landing made.

After that flights of only 300 to 500 feet were made.

Oct. 26. Farman again makes several flights of from 300 to 900 feet. The machine rose easily at the will of the operator and travelled at heights varying between 30 and 40 feet. No shock was felt on landing.

Oct. 26. La Patrie manoeuvres again over Paris, after an overhauling, carrying five officers and two ladies. During the flight the right propeller was lost and the ship drifted aimlessly around for an hour but the descent was finally accomplished in safety.

Oct. 26. Farman covers 2,530 feet, nearly a half mile, in 52 seconds. After running along the ground for about 600 feet, the head of the machine was raised and the flight begun, continuing at an elevation of 3 to 18 feet. In the morning he covered 1,191 feet in 30 seconds. In the afternoon the first flight was of 1,050 feet in 27 seconds, then 1,345 feet in 31 3-5 seconds, so that the record of Santos Dumont was broken three times before on the same day. By this flight Farman wins the Archdeacon cup and a money prize offered by the Aviation Club de France for the first flight of 984 feet or more.

Oct. 27. Esnault Pelterie makes several short flights, varying from 150 to 500 feet and turning in a semi-circle. A slight accident befell the wing of the machine in landing and further trials were postponed.

Oct. 31. Parseval dirigible refuses to start for the several hundred engineers assembled. Major Parseval explained the principles of the ship and on attempting to give a demonstration found the sparking apparatus was out of order. The balloon was returned to the workshop.

OCTOBER ASCENSIONS.

October 2. Captain Chas. De F. Chandler (Aero Club of America) in the Signal Corps No. 10, 2,200 cubic metres, at Washington, D. C. Landing at Laurel, Md., 22 miles from Washington. Highest altitude 4,500 feet. Very little wind.

October 2. A. Leo Stevens (Aero Club of America) and F. H. White in the Psyche, 1,000 cubic metres, Washington, D. C., at 4:10 p. m., landing at Columbia, Md., at 7:20 p. m. Distance, 37 miles. Highest altitude, 6,000 feet.

October 3. Captain Chas. De F. Chandler (Aero Club of America), Captain F. B. Hennessy and Corporal Ward, in The Signal Corps No. 10, 2,200 cubic metres, at 12:49 p. m. Landing at Marley, Md., 3:30 p. m. Distance, 31 miles. Highest altitude, 3,000 feet.

October 15. J. C. McCoy and Capt. Chas. De F. Chandler, (Aero Club of America), balloon Psyche, 1,000 cubic metres. Start in St. Louis at 2 p. m. Landing at Jacksonville, Ill., at 5:15 p. m., a distance of 87 miles. Went through thunderstorm half an hour after start.

October 17-18. Captain Chas. De F. Chandler and J. C. McCoy (Aero Club of America) in Signal Corps No. 10, 2,200 cubic metres, from St. Louis at 4:18 p. m., the 17th. Landing at Walton, W. Va., 12:33 p. m. (Central time), the 18th. Distance, 475 miles; elapsed time, 20 hours, 15 minutes. This trip won the Lahm Cup for the first time since its offering, beating the required distance (402) by 73 miles. This was the third time the Cup had been competed for. Former trials: J. C. McCoy and Capt. Chandler on April 30 in the America, 135 miles; July 4, Carl E. Myers in the Carlotta, 3 miles.

October 17-18. Alan R. Hawley and Augustus Post (Aero Club of America) in the Stevens 21, 1,000 cubic metres, from St. Louis 6:30 p. m., landing at 6:30 a. m. the 18th at Boggstown, Ind. Distance, 225 miles. Elapsed time 12 hours. Average speed 21 miles.

October 21. Major Henry B. Hersey and A. T. Atherholt, Alan R. Hawley and Augustus Post, J. C. McCoy and Capt. C. De F. Chandler (Aero Club of America). See records of Gordon Bennett Race.

October 26-27. Henry S. Gratz (Aero Club of America), Samuel A. King, pilot, J. E. Rech, Dr. George H. Simmerman, J. L. Mayer, John Longacre, Dr. T. E. Eldridge (Ben Franklin Aeronautical Ass'n), from Philadelphia in the Ben Franklin, 2,600 cubic metres, at 2:35 p. m. First landing made at Aura, N. J., at five o'clock, distance 19 miles. Messrs. Gratz and Longacre left the balloon at this point and returned to Philadelphia. The others started again at 1 a. m., the 27th, landing at Dwight, Mass., 225 miles from Philadelphia, at 9:30 a. m. Altitude reached, 15,400 feet.

October 12. Joseph A. Blondin (Aero Club of America) in the Albuquerque, 1,000 cubic metres, from Albuquerque, New Mexico, at 11:55 a. m. Landing was made on the mesa west of Corrales, 2:55 p. m., a distance of 16 miles. Considerable interest attaches to trips made in this part of the country on account of the rarity of the air. In speaking of the trip, Mr. Blondin said:

"I should estimate that I reached an altitude of fully 6,000 feet above the ground, or between 11,000 and 12,000 feet above sea level. I figure my altitude chiefly from the fact that I could look down upon the tops of the Sandia mountains and could get a magnificent view of the plains and the farther range east of the Sandias. The highest point of the Sandias is approximately 10,000 feet, I believe. The top of the Sandias is thus 5,000 feet higher than Albuquerque, and I was fully a thousand feet higher than the mountain tops.

"The landing was a trifle rough, as I had neither trail rope nor anchor to break the fall. The car struck the ground heavily, rebounded possibly twenty feet in the air, struck again, roled on its side and dragged for a distance of some fifty yards across the mesa. Finally it jammed against a hillock of Spanish needles, which enabled me to get an extra hitch on the valve rope and hold the valve open until all the gas escaped and the bag settled to the ground.

"The effect of the sight of the balloon on the natives was interesting. While up in the air I was shot at at least eight times between here and Corralles, but owing to the altitude the bullets fell short. Or at least they did not come close enough to bother me. There was a great uproar as I passed over Alameda, eight miles north of here. The hens set up a great cackling, roosters crowed, dogs barked, people shouted and the noise was incessant as long as the balloon was overhead. The blending of these unusually discordant sounds heard at an altitude of 4,000 to 5,000 feet made them seem to form a most agreeable and musical harmony.

"The view of the Rio Grande Valley, the adjacent plains, the mountains and the country beyond is of a grandeur which it is impossible to describe. It was overwhelmingly magnificent. The whole country lay spread out like a map, the mountains were dwarfed by the altitude, the river shone like a band of silver through the valley and the distant views were awe-inspiring. For at least two hundred miles in every direction the vista extended, and it was a vista such as one does not often see. Perhaps the prettiest prospect adjacent to the city was the view of the Bluecher gardens in Old Albuquerque, the plats lying spread out in geometrical precision with the colors making them resemble a crazy quilt."

The gas was very poor and prevented a longer trip.

NOTES.

Dr. Julian P. Thomas has purchased the Pommern, the winning balloon in the Gordon Bennett, from Herr Erbslöh.

A man by the name of Wels, in Trautenau, Austria, is said to have accomplished a glide of 950 feet from an elevation of 65 feet.

A. Roy Knabenshue, whose dirigible, tents and paraphenalia were recently destroyed by fire, announces his intention of using a 25 horse-power motor in the new dirigible to be built.

The large dirigible which was being built by the National Airship Co., of San Francisco, broke from its mooring and was blown by the strong wind several miles and destroyed.

On September 30 there came into active life the Aviation Club de France. Messrs. L. Delagrange, Paul Roger, A. Buisson, G. Voisin, Henry Farman, the Marquis A. de Puybaudet and Comte G. de Fayolle, and others were present. M. L. Delagrange was elected President.

Santos Dumont has, it is reported, abandoned the attempt to make 100 kilometres an hour with his hydroplane, owing to the impossibility of securing a good working motor. In a trial he covered 300 metres at a speed of between 50 and 60 kilometres an hour.

Engineers are at work improving La Patrie. As soon as this is finished a start will be made on the five other airships ordered by the French Government, the Republique, Democratie, Liberte, Verite and Justice.

Money is beginning to flow to the inventors. J. Uherkovich de Uherkocz, 213 East 22d Street, Bayonne, N. J., has induced City Recorder Lazarus and others to organize a company to build his orthopter. Here's to success!

Zeppelin is to build another airship, No. 4. This is to be still larger than the present ship and equipped with 300 horse-power, undertaken, it is said, at the suggestion of the German government which has appropriated $125,000. It is to carry 18 men. Part of the material now in the No. 3 will be used in the new one.

Dr. T. Chalmers Fulton, Pres. of The Ben Franklin Aeronautical Soc. of the U. S., will lecture before the Department of Engineering and Technology at the Drexel Institute, Tuesday, Nov. 12th, at 4 o'clock P. M. Subject: "The Problems of the Future—Aërial Navigation, the result of Thirty-three Years of Study and Many Trips Aloft."

H. C. Gammeter has shipped the orthopter on exhibition at the Aero Show to the Curtiss plant at Hammondsport, where a building will be erected to house it and further experiments conducted. Great appreciation was expressed of the fine workmanship displayed in the machine, which was the only full-sized gasless machine on exhibition.

Special appropriations are reported to have been made by the Japanese Government for the promotion of aeronautics. Balloon ascents at Tokio are frequent, but the details of the work and the number or quality of the dirigibles planned or in course of construction are closely guarded.

M. Capazza, the Belgian, whose balloon Paul Nocquet used on his ill-fated trip, has invented a combination aeroplane and dirigible capable of carrying five people in addition to 20,000 pounds, and of staying aloft for 15 hours. The machine has several screws and is of an imperfect lenticular shape.

Among the interesting exhibits at the Show were the flying paper models of William Morgan. These ingenious toys have given him the inspiration for a large machine which is now in course of construction at Fort Plain, N. Y.

On October 2 Eugene Godet attempted a flight in his dirigible at Jamestown Exposition. The propellers struck a water tower near the Inside Inn and were knocked off. After ascending rapidly and then down into the water of Hampton Roads, he rose again and drifted toward Newport News. Landing was made at Hampton, twelve miles from the start, most of the trip being over the water.

On his return to this country the press agent spirit of Frederic Thompson was found on the job. He announced his project to build a balloon park at Fort George and offers $25,000 to the first to fly from Fort George to Coney Island. We hope that this is true, but we heard last summer of a passenger line of dirigibles between these two points which same did not pan out.

On October 1, Dr. Alexander Graham Bell, F. W. Baldwin, of Toronto; G. H. Curtiss, of Hammondsport; J. A. D. McCurdy, and Lieutenant T. E. Selfridge, organized the "Aerial Experiment Association." Lieutenant Selfridge is Secretary. Experiments now under way will be conducted by these five acting in co-operation. The headquarters are at Beinn Bhreagh, near Baddeck, Nova Scotia, but for the winter a change may be made to Hammondsport, N. Y., at the Curtiss shops.

At Fort Omaha the construction of the government balloon house and hydrogen gas house for generating and compressing gas for balloon purposes is progressing. The space is somewhat limited, but plans are under way for increasing same. The balloon shed will be of steel superstructure with corrugated steel sheathing, foundations and floor of cement. The gas building will be of brick and concrete with corrugated iron roof.

Those who visited the Aero Show saw an entirely different type of motor, exhibited by the Aero & Marine Motor Co., 60 Pemberton Square, Boston, of which a detailed description will be given later. The G. H. Curtiss Mfg. Co. of Hammondsport, N. Y., exhibited four airship motors, 1, 2, 4 and 8 cylinders, of their regular type. Another feature of the motor section was the 130 horse-power engine used in Cooper Hewitt's hydroplane.

"There is always the consolation that when Uncle Sam really sees the situation he takes no half-way measures, and so I look upon the present agitation and attention to aerial machines of warfare as fortunate in that Congress will be convinced of the necessity for radical action to enable us to 'catch on' and catch up. Uncle Sam has long since emigrated to Missouri and has succumbed to his environment. But like the man that has been asleep he wakes up with refreshed life and as soon as 'shown' is the most active man possible."—*Colonel Glassford in the "Omaha Bee."*

Aeronautics is, or are, certainly booming in America——according to surface indications. There is a certain interest taken in the subject by a great many, but a very few are interested to the extent of $3. Still, it may be possible that the American Airship & Balloon Corporation, capital $200,000, of which Israel Ludlow is Vice-President and Charles J. Strobel is President, will find more than we have. This ambitious concern expects to build dirigibles for the United States Government, flying machines, balloons, etc., in addition to cornering the show business for this country.

At a banquet of the Aerial Experiment Association at Halifax, a cup was given

G. H. Curtis in acknowledgment of his making the fastest mile ever traveled by a human being (in 26 2/5 seconds). This performance was accomplished on January 23, 1907, at Ormond Beach, Florida, on a Curtiss motorcycle. Another "favor," in the form of a cup, was presented to Captain Thomas S. Baldwin, in honor of his successful flights at Halifax with the California Arrow, and of the fact that he has been an aeronaut for 32 years, having made his first ascension in 1875. Captain Baldwin was the first man to use a parachute in America.

Now that so much attention is being paid to the problem of navigating the air, it may not be amiss to recall that a strange effort in this direction was made just 400 years last month. It was in September, 1507, that King James IV sent a special ambassador from Edinburgh to France. An adventurer, John Damian, who had gained the favor of the king, said that he would reach France before the ambassador by simply flying there. He had a pair of huge wings made of eagles' feathers, fastened them to his body, and in the presence of thousands of people he launched himself into the air from the walls of Stirling castle. Instead of rising, though, he fell to the ground and broke his leg. The air navigator's excuse for his failure was that some cock's feathers had been mixed in with the eagle's plumes, and that these influenced the body earthward.

On October 15th the following was received from the Aerial Experiment Association:

"We are nearly ready to put a large machine into the air, and it is possible that within the next week or so, we may fly the machine as a kite, with a sand-bag in it of the weight of a man. If the experiment is successful, we shall place a man in the machine (without a motor) and allow him to glide down to the water from an elevation. I do not think it will take us longer than about a week or ten days to reach this stage. I doubt very much whether we shall be able to make an experiment with a motor-driven machine before the cold season comes in, although we have our motor and propellers completed. We do not think it would be safe to start at once to put a man into the air in a motor-driven machine flown as a kite and towed by a motor-boat. We propose to allow our aviator to have considerable practice in gliding-flight before putting the motor and propellers into the machine."

The Allgemeine Automobil Zeitung, in its issue of October 25, has this to say of the Wrights: "It is reported that the Brothers Wright have sold their flying machine for 2,000,000 francs to an American-English syndicate and that there are already under way negotiations with the English government for the further sale. We might put a heavy question mark after this information, judging by the news distributed through the press during the last few weeks and remembering that such news maintained that the brothers had sold their flying machine to a French syndicate, in which even it was specified how much money was paid in and how much stock the Wrights had received for their invention. Last week the Wright brothers were in Berlin where they were said to be in negotiations with the German government also for the sale of their machine (??)."

The continuation of the Aero Club of St. Louis and the holding of a large aeronautical carnival each October was virtually decided upon at the meeting of the Board of Governors at the St. Louis Club. The members were unanimously in favor of the perpetuation of the organization for annual contests.

The club voted to increase the membership from 400 to 600, due to the large number of applications pending. President Dozier was empowered to appoint a committee of three to recommend a programme and the prizes for the aero contests next October. This committee is to report at a special meeting to be called soon.

The Aero Club of St. Louis is to be in absolute charge of all aero contests in St. Louis, was the club's decision.

A letter, conveying the offer of Augustus A. Busch and Edward A. Faust of a cup to be known as the Busch Trophy and valued at $1,000 or more, was read. Acceptance was deferred until a later meeting. A letter conveying the thanks of the Club will be written by Secretary Kearney.

The report of the Chief Signal Officer of the United States Army for the year ending June 30, 1907, contains the following under the head of "Military Aeronautics;" "During the past year investigation and experiments have been made with a view of securing hydrogen in large quantities at low cost. The results were not satisfactory, and it has been decided to establish a plant for producing hydrogen by the electrolysis of water. Orders have already been placed for the necessary electrolytic cells and the electrical machinery. This plant will be established at Fort Omaha, Neb., and the Quartermaster Department has already prepared plans for a suitable building to inclose this hydrogen plant, and also a large steel balloon house of a size sufficient to fill hydrogen balloons and to carry on experiments with any size and type of dirigible balloons or flying machines which may in the future be presented for trial. Hydrogen for captive and dirigible balloons will be compressed in tubes at high pressure at this Omaha plant and shipped to any point where required for use, this method being considered preferable to using portable generators.

"The Signal Corps has recently purchased a complete military captive balloon, with all appurtenances, with a capacity of 300 cubic metres, and also an ordinary spherical balloon with a capacity of 2200 cubic metres, which was designed to be filled with coal gas and used for preliminary instruction of officers and enlisted men of the Signal Corps in the elementary principles of aeronautics. This balloon on the trial trip made a successful voyage from Washington to Harrisburg, Pa., a distance of 104 miles, in four and one-half hours.

"In addition to the installation of a gas generating plant and balloon house at the Signal Corps post, Fort Omaha, Neb., it is also intended to provide practical instruction in military aeronautics suited to the needs of the three service schools at Fort Leavenworth, Kan.

"Paragraph 34, General Orders No. 145, War Department, August 16, 1906, now requires theoretical and practical instruction in aeronautics at these schools, but the instruction has thus far been limited to a theoretical study of the subject due to a lack of suitable equipment for this station."

THE MYSTERY OF BIRD FLIGHT.

Everybody's Magazine.

"In the excellent article on 'The Mystery of Bird Flight,' by Harold Bolce, in *Everybody's* for August, allusion is made to the fact that the size of the wings decreases in proportion to the increase in size of the body of the flying creature, and it is called 'a most puzzling paradox, perhaps the most mysterious of the enigmas of bird flight.'

"As the solution of the problem of aerial navigation depends largely on an accurate knowledge of the principles governing bird flight, and as the problem is daily becoming of greater popular interest, it may be well to state that the proportion of wing surface to weight follows a very simple and easily understood law.

"The sustaining power of the wings depends not on their area, but on their displacement. If we take two wings of equal width, but one double the length of the other, and move them through the segment of a circle, the larger one will displace four times the air that is displaced by the shorter one. But if we keep the wings of

equal length, but have one double the width of the other, the wider one will displace only twice as much air as the narrower one. The sustaining power, therefore, varies directly with the width of the wing, but varies as the square of the length.

"If we assume that the wings of all birds are of the same proportionate shape, and that all birds are equipped with the same power of flight—both assumptions being correct only in a very general way—we have the following equation for determining their wing area:

"The wing surface in square feet equals the square of the cube root of twice the weight in pounds. If we apply this law to some of the birds as given in the table of wing areas in Mr. Bolce's article, we obtain the following figures:

Name	Weight in pounds	Wing Surface in Square Feet	Sq. Ft. of Wing Surface per pound of Weight	Theoretical Wing Surface. Sq. Ft.
Screech-owl..........	0.33	0.776	2.35	0.757
Sparrow-hawk......	.336	.69	2.05	....
Blackheaded gull...	.619	.92	1.49	1.00
Goshawk................	.641	.84	1.31	....
Fish-hawk............	2.80	3.01	1.108	3.13
Turkey-buzzard	5.6	5.33	.95	5.00
Flamingo	6.34	3.50	.55	....
Griffin-vulture	16.52	11.38	.68	10.24
Condor	16.52	9.80	.59	10.24

"Mr. Bolce states that 'the Australian crane, for instance, weighs over three hundred times more than the sparrow, but in proportion has only one-seventh of the wing area of the smaller bird.' Under this law, with a wing area of only one-seventh proportionately, it should weigh 343 times more.

"Mr. Bolce also states that 'the stork weighs eight times more than the pigeon but in proportion has only half as much wing surface.' This agrees exactly with this law.

"I do not know whether this law governing wing areas is known to others studying aerial navigation. I found it necessary to reduce it to a definite formula in my investigations.

"Applying this law to human flight, if a man should equip himself with artificial wings, and the combined weight of man and wings should be 200 pounds, he would need a wing surface of 54.17 square feet. A flying machine weighing 2,000 pounds would require a wing area of 250 square feet. H. R."

New York.

AERONAUTIC CALENDAR.

Nov. 15.—International Exposition of Aeronautic Photographs, at Paris.
Dec. 8.—Aeroplane race at Issy les Moulineaux.

CORRESPONDENCE SCHOOL OF AERONAUTICS IN AMERICA.

Messrs. Albert C. Triaca and R. B. Whitman, of the New York School of Automobile Engineers, intend to inaugurate about January 1st, 1908, a school for the instruction of amateurs in aerostation and aviation.

Col. Espitallier has arranged a series of forty lessons, divided into four parts: spherical balloons; dirigibles; aviation, aeroplanes, helicopters, hydroplanes, etc.; and practical application of the principles of aeronautics. The material for these papers has been collected from authorities all over the world. There will be a directing committee composed of those most renowned in aerostation and aviation. Practical lessons in ballooning will be under the charge of Charles Levee, a pilot of the Aero Club of France.

COMMUNICATIONS.

To the Editor,

American Magazine of Aeronautics.

Dear Sir:

In your October number I have noticed among your list of communications, the letter headed "An Appreciation," and signed by F. A. Postnikov, Lt-Col., Military and Civil Eng., Aeronautic Grad.

It strikes me that he is making a serious mistake in his accusations, in reference to the inventive genius, inasmuch as he is striking at the one that we must look toward for the successful accomplishment of aerial navigation.

His claiming that ninety per cent. of inventors being ignorant maniacs is absurd. I admit that there are some very ignorant ones, and also some maniacs, but I have found that the most ignorant ones are not in the inventive class, but in the class that think that they are going to be "swindled," owing to their "selfish desire" to keep the money that they have in their possession.

For the sound and honest people, really interested in the rapid solution of aerial navigation, there is only one way, let the man with the capital take hold, hand in hand, with the man with the brains (do not consider him an ignorant maniac, because he toils in his little shop, in secrecy, to the small hours of the morning, while the man of money is idling his time at the clubs, wasting his money on his own "selfish desire" for pleasures) and work honestly.

Money is a very hard thing to get by the average mechanic, but brains of inventive qualities are still harder to obtain. Therefore, the man with the capital should step forward and assist the man who oftimes is bright and intelligent, and one who has matured his plans, and is being made a maniac owing to the lack of funds that are hindered by the "selfish desire" of the man with the money. What is our greatest obstruction to the success of aerial navigation? It certainly is not the lack of ambition of the inventor, as he is only too anxious to bring his invention before the public, to show what he can do, as all the average mechanic has to glory in is in showing his accomplishments.

What hinders him most? The lack of money! And the cause of this is the "selfish desire" of those that have it to keep it in their possession, or for their own pleasures.

Again, why is America so far behind European countries in aerial navigation? Because the American man of money is so full of this "selfish desire" that he must set ten dollars coming in before he will spend one out. In foreign countries the man with the capital will assist the inventor, therefore they have obtained better results. As to the false ambitions of inventors, those people accomplish little, their achievements do not amount to enough to interest any one, while on the other hand, the "selfish desire" of the money man can be classed with the false ambitious inventor, as he is a greater obstruction toward the perfection of aerial navigation.

Now, then, let us cut this "selfish desire" and let the man with the money invest with the manual and mental work of the inventor, and run a chance with bright thoughts and see if there shall not be something accomplished. Do not consider that ninety per cent. of the inventors are fools, but vice versa, and do what you can to help the cause along, as the average mechanic has the brains and no money, and the average money man has no——well has not the inventive ability, as he does not see time to waste on mechanics. Therefore, I ask the man of money to place it with the man of brains, and then we shall see success.

I am sure that the American Magazine of Aeronautics shall be of great assistance towards the perfection of the future aerial craft.

Yours truly,

DILLON HOFFMAN, M. E.

AERONAUTIC SOCIETIES OF THE WORLD.

To those who are unacquainted with the actual status of aeronautics the following list of aeronautical societies or clubs will prove most surprising. There are at the present time thirty-seven organizations whose energies are applied to the solution of aeronautical problems and it is not at all unlikely that this number will be added to very frequently.

A. INTERNATIONAL SCIENTIFIC SOCIETIES.

1. **The International Commission for Scientific Aeronautics.** Founded in Paris, September, 1896. The members include the directors of meteorological institutes in all countries. The object of the Commission is to investigate the conditions holding in the atmosphere up to the highest limit attainable by kites and balloons. Simultaneous ascents are made with this object from various meteorological stations all over the world on the first Thursday in each month.

2. **The Permanent International Aeronautical · Committee.** Founded by a resolution of the International Aeronautic Congress at Paris in 1900 in order to carry out the expressed wish of the Congress to advance the progress of aeronautics by scientific advice, and to prepare for the following congress. Offices, in the buildings of the Societe d'Encouragement, 44 rue de Rennes, Paris. The transaction of business is regulated by statutes published in 1901. The congress elected 33 members, who received the right to elect other members and to appoint sub-committees for special subjects.

B. FEDERATION AERONAUTIQUE INTERNATIONALE.

Founded on the 14th of October, 1905, in Paris. It has formulated special rules and regulations which are adopted by all amalgamated societies and clubs. The societies and clubs belonging to this Federation are indicated by an asterisk. (*)

C. NATIONAL SOCIETIES.

*I. **Deutscher Luftschiffer-Verband.**

Founded at Augsburg on the 28th of December, 1902, for the purpose of increasing the general interest in aeronautical matters, and more especially for:

(a) Supporting a monthly aeronautical journal (Illustrierte Aeronautische Mitteilungen).

(b) The publication of a year-book.

(c) The Superintendence of the training of aeronauts.

(d) The publication of the qualifications necessary for an aeronaut as laid down by the society.

Address, Care of Hauptmann Hildebrandt, Kirchstrasse 2, Charlottenburg.

The following German societies belong to this National Federation.

1. **Berliner Verein für Luftschiffahrt.** Founded August 31, 1881, in Berlin. Published the Zeitschrift für Luftschiffahrt from 1882 to 1900, when the Illustrierte Aeronautische Mitteilungen was adopted as the official journal of the Verein. The Verein owns several balloons and has arranged numerous ascents, under the patronage of H. R. H. the Kaiser. The society has instituted stations for balloon ascents all over Germany, wherever the balloons can be conveniently inflated. Headquarters, Dresdenerstrasse 38, Berlin, S. 14. Number of members 807, including 134 qualified aeronauts.

2. **Münchener Verein für Luftschiffahrt.** Founded November 21, 1889, at Munich. Published annual proceedings up to 1901. Contributed to the Zeitschrift für Luftschiffahrt up to 1898, and subsequently to the Illustriete Aeronautischen Mitteilungen. Owns balloon equipment and has arranged numerous ascents since

1889. Membership 383, including 53 qualified aeronauts. Headquarters, Kaufingerstrasse 26, Munich.

3. **Oberrheinischer Verein für Luftschiffahrt.** Founded July 24, 1896, at Strasbourg. Published the Ill. Mitteilungen des Oberrheinischen Verein für Luftschiffahrt up to 1898, when this journal was re-organized as the Ill. Aeronautische Mitteilungen. Owns balloon equipment and has arranged ascents since 1897. Membership 200, including 25 qualified aeronauts. Headquarters, Munsterplatz 9, Strasbourg, I. E.

4. **Augsburger Verein für Luftschiffahrt.** Founded in June, 1901, at Augsburg. Owns balloon equipment and has arranged ascents since 1901. Membership 321, including 36 aeronauts. Headquarters, Carolinenstrasse 83, Augsburg.

5. **Niederrheinischer Verein für Luftschiffahrt.** Founded December 15, 1902, at Barmen. First ascent January, 1903. Owns balloon equipment. Membership, 633, including 15 aeronauts. Headquarters, Königstrasse 35, Barmen.

6. **Posener Verein für Luftschiffahrt.** Founded December 2, 1903, at Posen. First ascent, December 19, 1903. Membership, 83, including 9 aeronauts. Headquarters, Gartenstrasse 10, Posen.

7. **Ostdeutscher Verein für Luftschiffahrt.** Founded June 11, 1904, at Graudenz, West Prussia. First ascent July, 1904. Number of members 150, including 10 aeronauts. Headquarters Ostbank für Handel und Gewerbe, Pohlmannstrasse 9, Graudenz.

8. **Frankischer Verein für Luftschiffahrt.** Founded May 12, 1905, at Würzburg. First ascent February, 1905. Membership 150, including 6 aeronauts. Headquarters, Bergmeisterstrasse 11, Würzburg.

9. **Mittelrheinischer Verein für Luftschiffahrt.** Founded May 11, 1905, at Coblenz. Membership 83, including 4 aeronauts. Headquarters, Casinostrasse 37, Coblenz.

10. **Kölner Klub für Luftschiffahrt.** Kallenburg 1-3, Köln.

11. **Physikalischer Verein im Frankfort A. M.,** Stiftstrasse 32, Frankfort.

12. **Motorluftschiff - Studiengesellschaft m. b. H.,** Spandauerweg, Berlin.

II. SOCIETIES OF OTHER NATIONS.

13. **Wiener Flugtechnischer Verein.** Founded August 18, 1887, in Vienna, as an offshoot of the Oesterreichischer Ingenieur Verein. Contributed towards the cost of Wilhelm Kress' flying machine. Membership about 90. Headquarters, Eschenbachgasse 9, Vienna, I.

14. **Wiener Aero Club.** Founded in August, 1901, at Vienna. The club possesses its own grounds and balloon equipment and has organized ascents since 1901. Publishes a monthly journal, Wiener Luftschiffer-Zeitung. Membership 79, including 9 aeronauts. Headquarters, Annahof 3, Vienna, I.

15. ***Aero Club Suisse.** Founded March 30, 1901, at Berne. Owns balloon equipment. First ascent July 11, 1902. Membership 140. Headquarters, Hirschengraben 3, Berne.

16. **Aeronautical Society of Great Britain.** Founded January 12, 1866, and consequently the oldest aeronautical society. First general meeting June 27, 1866. Brought out from 1866 to 1892 annual reports and has published quarterly since 1897 the Aeronautical Journal of Great Britain. In 1901 the society founded an aeronautical museum. Membership 120. Headquarters, 53 Victoria St., London, S. W.

17. ***Aero Club of the United Kingdom.** Founded in January, 1902, in London. Headquarters 166 Picadilly, London, W.

18. ***Aero Club of America.** Founded in November, 1905, in New York.

Number of members, 300. Headquarters, 12 East 42nd St., New York.

19. **Aero Club of Philadelphia.** Founded in Philadelphia, 1906. Number of members, 40. Headquarters, Philadelphia, Pa.

20. **Aero Club of St. Louis.** Founded in January, 1907. Headquarters, St. Louis, Mo. Membership, 350.

21. **Aero Club of Chicago.** Founded in May, 1907. Headquarters, 79 Randolph St., Chicago, Ill.

22. **Svenska Aeronautiska Sallskapet.** Founded at Stockholm, December, 1900. Membership 80. Headquarters, Stockholm.

23. **Societe Francais de Navigation Aerienne.** Founded in Paris, August, 1872. Publishes a monthly journal, L'Aeronaute. This society is the oldest aeronautical society in France. Number of members, 103. Headquarters, Hotel des Ingenieurs Civils de France, 19 Rue Blanche, Paris.

24. **Aeronautique Club de France.** Founded October, 1897. Has branches in Paris and Lyons. Its objects are the propagation of a knowledge of aeronautical matters and the education of as many aeronauts as possible among the civil population. Membership, 350 in Paris, 150 in Lyons. Its official organ is L'Aeronautique, published quarterly since 1902. Ladies are admitted as members. Annual distribution of medals and prizes to balloon conductors belonging to the society. Headquarters, 58 Rue J. J. Rousseau, Paris.

25. ***Aero Club de France.** Founded in Paris, December, 1898. Adopted the monthly journal L'Aerophile as its official organ in 1901. The club is distinguished for its great activity in aeronautical matters. In 1900 it offered the Deutsch prize of 100,000 francs to the first aeronaut to start from the Park, St. Cloud, go around the Eiffel Tower and return to starting point within 30 minutes. The prize was won by Santos-Dumont October 19, 1902. In 1903 numerous medals were offered in connection with various competitions and balloon sports. Membership 700, including 60 aeronauts. Headquarters, 84 Faubourg St. Honore, Paris. Owns balloon equipment.

26. **Academie Aeronautique de France.** Founded in 1902. Headquarters, 14 Rue des Goncourts, Paris.

27. **Societie des Aeronautes du Siege.** Founded in 1902, the membership of the society being confined to persons who escaped from Paris during the siege of 1870-71 by balloon. In 1903 the society had only 31 members.

28. **Aero Club du Sud-Est.** Founded in Bordeaux in April, 1905. Number of members, 175, including 10 pilots. Owns balloon equipment. A section of the club was formed at Pau in December, 1905, comprising 21 members. Headquarters, Bordeaux.

29. **Aero Club du Rhone.** Headquarters, 4 Quai Pecherie, Lyon.

30. **Aero Club du Nord.** Headquarters, 4 Rue de la Gare, Roubaix.

31. **Club Aeronautique de l'Aube.** Headquarters, 23 Place de la Bonneterie, Troye.

32. **Automobile Club de Nice** (Section Aeronautique). Headquarters, 7 Promenade des Anglais, Nice.

33. ***Aero Club de Belgique.** Founded in Brussels in February, 1901. Membership 300. Owns balloon equipment and publishes a fortnightly journal, La Conquete de l'Air. Headquarters, 5 Place Royale, Brussels.

34. ***Societa Aeronautica Italiana.** Under the patronage of the King of Spain. Founded in Rome, March, 1904. The society is divided into three sections: Rome with 136 members, Turin with 29 members and Milan with 17 members. Owns balloon equipment. Headquarters, Via Della Muratte, 70, Rome; Via Davide Bertoletti 2, Turin; Via Secco 2, Milan.

(Continued on page 45.)

RARE AERONAUTIC BOOKS FOR SALE

This magazine will publish each month a list of such rare books relating to aeronautics as it is able to secure.

If you desire any of those listed, kindly send check with your order for the amount stated. Should the book ordered be sold previous to the receipt of your order, the money will be promptly returned.

Astra Castra (Hatton Turner). Royal 4to, cloth, gilt top, uncut, London, 1865............$15.00

An Account of the First Aerial Voyage in England (Vincent Lunardi). Portrait of Lunardi by Bartolozzi and plates. Crown 8vo, half calf, uncut, London, 1784. Autograph "V. Lunardi" on fly-leaf......... 15.00

Travels in the Air (James Glaisher). 8vo., cloth, London, 1871. .... 10.00

Crotchets in the Air (John Poole). 12 mo., cloth, London, 1838 .... 5.00

Flying and No Failure. Very rare reprint. Pamphlet. London, 1751................. 3.00

By Land and Sky (John M. Bacon). Four illustrations. 8vo, cloth, uncut, London, 1901 2.50

A Balloon Ascension at Midnight (G. E. Hall). Plates by Gordon Ross. 8vo, boards, uncut. San Francisco, 1902. Limited edition 2.50

Five Weeks in a Balloon (Wm. Lackland). 12 mo., cloth, N. Y., 1869..................... 2.50

Wonderful Balloon Ascents (F. Marion). 12 mo., half leather, N. Y., 1871 .... 2.50

My Airships (Santos-Dumont). Illustrated. Crown 8vo, cloth, uncut, London, 1904......... 2.50

The Dominion of the Air. The story of aerial navigation. Illustrations from photographs. Crown, 8vo, cloth, London, n. d. 2.00

My Life and Balloon Experiences. Photograph of author. Crown, 8vo, cloth. London, 1887 .... 2.00

Travels in Space (G. S. Valentine and F. L. Tomlinson). Introduction by Sir Hiram Maxim, 61 plates. 8vo, cloth, London, 1902. .... 2.00

Balloon Travels (Robert Merry). 12 mo., cloth, N. Y., 1865 ....$ 2.50

Aerodynamics. Illustrated. 1891. 2.00

Conquest of the Air (John Alexander). 12 mo., cloth, London, 1902 .... 2.00

The Motor and its Chief Application, Wings, Propulsion in Air, etc. (Com. of Pat., 1849). 8vo., paper 1.50

La Machine Animale (J. Marey). Illustrated, 8vo, cloth, Paris, 1878, French 1.25

Balloons, Airships and Flying Machines (Gertrude Bacon). 12 mo., cloth, N. Y., 1905 .... 1.00

(Continued from page 44.)

Aviation Club de France—President, L. Delagrange; Address, 3 Rue Taitbout, Paris.

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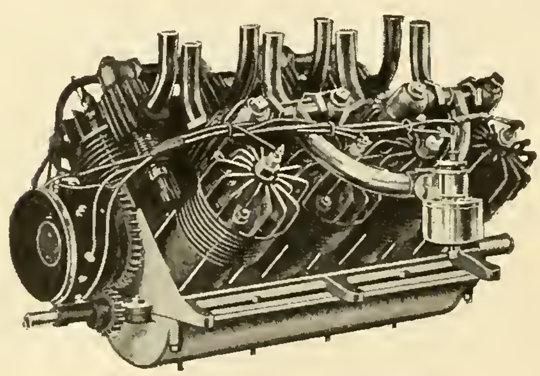

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The Air Fight over Trieste

—BY—

WILLIAM BEVIER ASHLEY

VOL. I. DECEMBER, 1907. No. 6.

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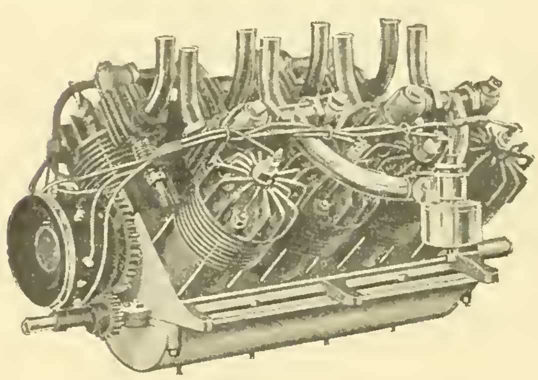

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SUMMARY.

THE NEED FOR A CLUB PARK.

Up to December 1st. 1907, 56 balloon ascensions have been made by 25 members of the Aero Club of America during the year. The majority of these have made but one or two trips each.

This is somewhat better than the record for 1906 but it can still be improved upon greatly if in some way the conditions for balloon ascents were made easier. The two balloons of the A. C. A. are now out of commission and unfit for use; and out of the 300 members there are but 7 privately owned balloons in the club. This means that members must either borrow these balloons or rent or buy balloons from manufacturers, of whom there are two in the club, Messrs. Myers and Stevens.

The cost of gas and rental does not figure so much as the loss of time incident to making a flight. If one goes to Pittsfield or North Adams, which are, of course, ideal locations, one loses practically three days' time; and that is under favorable weather conditions.

It does seem that the great need is a park somewhere near New York where private and club balloons may be stored and where gas can be obtained at short notice.

For instance, West Point, in' its scheme of beautification and enlargement, could be made a ballooning center for the East. It is a good location and has the advantage of being a military post. We would like to refer to an editorial in the

August number in which a plan was outlined by which the Government might co-operate with aero clubs to their mutual advantage.

If this were not possible, there are other towns along the Hudson River where gas could be secured, at least after some modification in the plants, still more convenient than West Point. For instance, there is one town in mind, 33 miles from New York, with trainst at least every hour, and an express stop, where there is a new gas plant. A large three-story brick building adjoins the works, on the same property. This building was intended for purposes in connection with the manufacture of gas but has not been used up to the present. In this building could be stored balloons and all facilities for repairs and experiments could be installed. The plant can furnish 500,000 feet of gas in ten hours, at the rate of 20,000 feet an hour—at least, that is the present rate of manufacture. While the gas is a mixed gas, coal gas could be furnished. Suppose a club should purchase such a plant and modify it to produce coal gas alone. It could supply the town at the regular rate, pay all expenses and have gas for ascensions without cost.

With good facilities for making flights more members would take advantage of opportunities and there would be more privately owned balloons and more chartered ascents.

Near the same place is a practically new race track, with buildings, where experiments with flying machines could be conducted. There are machine shops in the town and there seems to be many advantages for general aeronautic work.

It is to be hoped that 1908 will see a great increase in the number of balloon ascents and in aeronautic activity in this country.

AERO CLUB OF AMERICA.

The annual meeting was held November 4, at which the old officers were re-elected. Mr. James Gordon Bennett was elected an honorary member. The Gordon Bennett Cup was officially presented to Herr Oscar Erbsloh, the winner of the contest of that name.

At a meeting of the directors held November 27, the Lahm Cup was awarded to Captain Chas. De F. Chandler in recognition of his flight of 475 miles, from St. Louis, Mo., to Walton, W. Va., October 17-18.

New Members Elected.

Mr. Ralph Upson	Mr. A. H. Morgan
Mr. J. H. Wade, Jr.	Mr. W. G. Critchlow.

Members Posted for Election.

Mr. De Witt C. Morrell	Mr. Williams Welch
Mr. Leroy M. Taylor	Mr. A. Holland Forbes
Mr. John D. Larkin, Jr.	Mr. William Paine Everts.

The Automobile Club of America kindly offered the privileges of its rooms to the Aero Club on the occasion of the former's regular monthly dinner and smoker, Tuesday, December 3.

NEW AERO CLUBS IN AMERICA.

Aero Club of New England.

On November 21, at Young's Hotel, Boston, on the 124th anniversary of the first ascent by man in a balloon, was formed the Aero Club of New England, with 40 members. Professor A. Lawrence Rotch was elected president; Chas. J. Glidden, 1st vice-president; Frank E. Stanley, 2d vice-president; Alfred R. Shrigley, secretary; Harry G. Pollard, treasurer; A. Leo Stevens, aeronautical engineer.

Addresses were delivered by Professor A. Lawrence Rotch, Professor W. H.

Pickering, Messrs. Charles J. Glidden, A. V. Wilson, A. Leo Stevens, T. E. Byrnes, and L. J. Minahan.

Pittsfield has been selected as the official park.

SOME OF THE FOUNDERS OF THE A. C. OF N. E.

The Aero Club has offered a silver cup of the value of $100, donated by the Boston *Herald,* as a trophy to the pilot of any balloon starting 100 miles from Boston, air line, and landing within 5 miles of Boston Common. Notification must be made 24 hours before starting of the attempt by any pilot to win the trophy.

The matter of a challenge to the Aero Club of America, the Aero Club of Philadelphia and the Aero Club of St. Louis, for a race of 3½ hours' duration from Pittsfield, Mass., the winner to be the one landing the greatest distance from Pittsfield within the specified time, was referred to its Contest Committee, Messrs. George E. McQuesten, Henry Howard and W. E. Eldredge. The competition is limited to balloons of less than 40,000 cubic feet capacity.

Pittsfield Aero Club.

The Pittsfield Aero Club was formed at the Hotel Wendell, Pittsfield, Mass., November 15th, with the following officers: president, Mr. L. J. Minahan; vice-president, Mayor A. H. Bagg; treasurer, Ex-Mayor Daniel England; secretary, Mr. K. B. Miller, proprietor of the *Berkshire Daily Eagle.*

It is the intention of the club to purchase a balloon which will be rented during the season to its members. The club can do a great deal towards the encouragement of the sport of ballooning, especially as it is likely that the majority of ascents in this country will be from Pittsfield.

The Aeronautique Club of Chicago.

On November 22d the Aeronautique Club of Chicago was formed, with twenty charter members. A contract has been let for a balloon and it is expected to hold a series of races at Chicago during the summer of 1908. A cup of the value of $1,000 has already been donated.

The officers are: Mr. C. A. Coey, president; Mr. Charles E. Gregory, vice-president; Mr. A. B. Perrigo, secretary: M. H. C. Foster, treasurer.

Aero Club at Columbus.

The citizens of Columbus, Ohio, are about to form an aero club and secure permanent grounds where annual races may be held and where club members may make ascensions as often as desired.

At a meeting held at the Board of Trade on December 1st the matter was discussed in detail and the raising of funds was referred to a committee.

It is planned to hold a long distance race on next Decoration Day and all members of aero clubs in America owning balloons who wish to take part are requested to communicate with Mr. Henry P. Mattach, c/o Neil House, Columbus. A handsome cup will be offered.

Another club is soon to be formed in Louisville, Ky., by Messrs A. P. Shirley, J. L. Gribble and others.

BALLOONING, AND HOW I BECAME ADDICTED TO THE HABIT; DIRIGIBLES.

By A. Leo Stevens.

Being an address delivered before the Aero Club of New England upon the occasion of its organization meeting.

A. LEO STEVENS.

During my early school-days there was one particular story that impressed more than all the rest—that of a "professor" who was to ascend in a monster balloon. He had allowed two children to get into the car, with permission from their parents, but before the ascent was made a violent storm came up which tore the balloon loose from its moorings, taking the two youngsters on a wild ride. The professor stated that if the children knew enough to pull the rope which hung almost at their hands, they would descend safely to Mother Earth.

The story impressed me so much that I felt that if I had been in the car I would have pulled the cord. I told my father of my feelings and my ambition but he plainly told me I would be frightened to death. I waited my chance and every time I saw a balloon I was there to help.

I never will forget the first real balloon that I saw, bulging out to its fullest capacity in the public square of my native city. It was a beautiful creature to my imagination, and how grandly it left the earth!

On the next opportunity of seeing a balloon I struck up an acquaintance with the aeronaut, shoveled the iron, carried the acid, helped to haul the water, chop the ice and did all the running, ruining my knockerbockers with the acid, as I found out the next morning. Father was interested in the amusement park from which the ascension was to be made. The aeronaut promised to take me up and I worked like a trooper. But the following day when the balloon was inflated he told me the balloon was too small to carry two. As the day was Sunday, the Marshall played an important part and the ascent was not allowed to take place until the following day. I tried to persuade my boy friends to "borrow" the balloon by mistake but the plan failed.

I told my father I was going up and he replied, "Take safety knickerbockers with you and go as quick as you want," never thinking that I was truly in earnest.

In my rage, I stole to my father's hunting outfit, took a large knife and rushed panting up the hill to where the balloon was swaying in the air, full of hydrogen gas. The professor had gone to lunch; I jumped in the car, cut the ropes and left at railroad speed. Not until I was high in the air did I realize what I had done. The whole city seemed like a mass of water to me and I crouched down in the basket and thought what father and mother would do to me when I got—back? All this time I was travelling at the rate of twenty miles an hour and on peeping over the edge of the basket again I found no trace of the earth. Of course, I had no ballast, as it was all cut away when I started.

Finally, however, I descended safely on the outskirts of Canton, landing in a tree and tearing my clothes to pieces. The professor claimed the balloon was wrecked and received $500 from my parents, the cost of my first flight. A year or two after this I made my second trip and have been "going up" ever since, enjoying life far above the earth.

The first dirigible balloon in this country I produced in 1900 and I brought to this country, through a Mr. Skinner, a De Dion Bouton engine. I made several successful flights with this machine and designed many inventions of importance: among them, the sliding balance which enables the operators to set the machine at any angle and the aeroplane arrangement which brings the machine safely to earth. I was the first in the world to put the propeller in the forward end of the ship: as I found pulling the load was much steadier than pushing it.

Next year there will be balloons in all directions and I propose putting out a motor balloon which will enable the operator to go in any direction, using the present spherical balloon. I will use the motor made by the Aero & Marine Motor Co., right here in Boston. Mr. Washburn has convinced me that it is the greatest motor yet constructed. Shortly we will see the dirigible made of steel and the journey from Boston to Europe will be accomplished in two days. The balloon and airship has come to stay and with the present rapid improvements we will accomplish this in less than five years. First we must get our passengers accustomed to the upper air and teach them how to become experienced pilots and acquaint them with the engines of the air. Look upon the dirigible as a steamship. We could not drive the Lusitania across the ocean at enormous speed unless we applied the power. It is the same with the dirigible. The coming machine will be made of reinforced steel, with great strength and lightness.

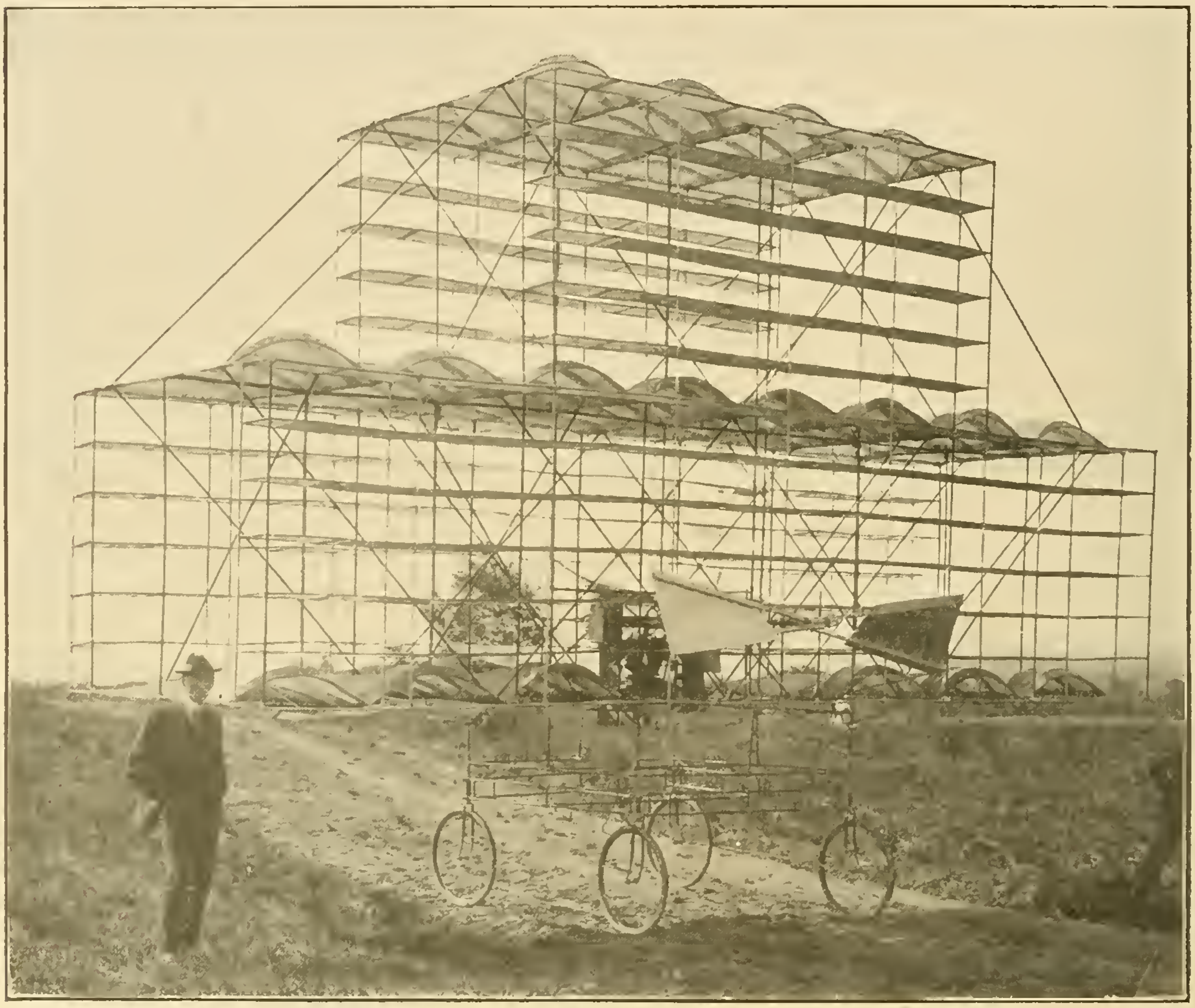
A balloon for three costs but $800 and the gas for this balloon, $35, including the help for inflating. Ballooning is the grandest and least expensive sport in existence; far superior to any other sport of human beings.

Now that we have formed an aero club here in Boston, let us show the world what ballooning is. In half a decade we will surpass all other countries.

THE ROSHON AEROPLANE.

The aeroplane of Mr. J. W. Roshon, of Harrisburg, Pa., has just been completed but no trials have yet been made. The use of the large number of superposed planes makes a description of it of interest.

The inventor has spaced the surfaces as far apart, one above the other, as the width from front to rear. Along the front of the machine is a set of 13 superimposed, long, narrow canvas planes. The lower of these measures 1 foot by 24 feet and the upper ones are 1 foot by 12. Six feet to the rear is another set identical with those in front.



THE ROSHON AEROPLANE.

In addition to the small surfaces are 3 large horizontal ones. Two of these are 6 feet by 24 and the other 6 by 12 feet. This gives a total horizontal surface of 840 square feet, with small size. The whole apparatus measures 24 feet wide, 8 feet in depth and is 17 feet high. The weight is 225 pounds. The motor, 75 pounds, and the operator, 115 pounds, bring the total weight ready for flight up to 415 pounds. The surface per pound is 2.02 square feet, a loading of less than ½-pound per square foot.

The motor is a 7 h.p. Curtiss, driving a propeller 8.5 feet in diameter, geared to 200 r. p. m. "It is expected to get up preliminary speed by running down hill, in which case the motor may have sufficient power to keep up the speed."

Very little efficiency can be expected from the rear surfaces as they must needs follow in a current of air which is already traveling downward and can, therefore, offer but little support, unless these rear surfaces be inclined at a considerably greater angle than those in front, while at the same time these rear surfaces offer practically an equal drift or resistance to forward motion as those in front.

Turning the rear surfaces at a steeper angle would destroy the apparatus's power of automatically maintaining its equilibrium, and when inclining them at a greater angle the only way in which they can be made to carry any considerable portion of the load is to incline the whole apparatus at a very steep angle, something like 20 to 30 degrees with the horizontal, a condition which would involve a tremendously heavy pull of the screws to keep the apparatus afloat, in that, a thrust of over 40 per cent., and possibly even over 55 per cent. of the total weight of the apparatus would have to be furnished by the screws. Assuming a total weight of 400 pounds would necessitate a screw thrust of 200 and to produce this thrust at flying speed would require an engine of upwards of 25 h.p.

GORDON BENNETT, 1907.

From the logs of the contestants and various other sources a map has been prepared, showing the actual course taken by the balloons in this race. A table of the actual distance traveled by each and the average speed is given below:

Photo by C. W. Bright.

ST. LOUIS ANJOU ABERCRON LOTUS II AMERICA DUSSELDORF ISLE DE FRANCE UNITED STATES POMMERN

READY TO START, GORDON BENNETT, 1907.

The crowd is watching the flight of the pilot balloon sent up by Professor Rotch.

	Actual Distance Traveled	Speed per Hour
Isle de France	978	28
Dusseldorf	913	26
Pommern	901	29
America	848	25
St. Louis	798	25
Anjou	795	24
Abercron	788	23
United States	756	43
Lotus II	445	21

The average distance would, therefore, be 802.44 miles, at a speed of 27.11 miles per hour.

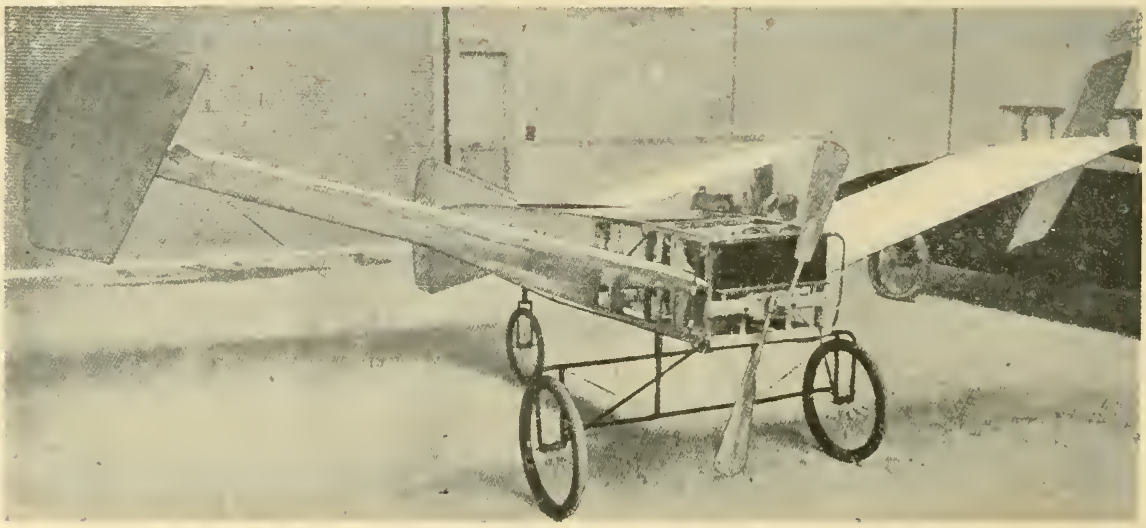
THE NEW BLERIOT, NO. 7.

In its last flight the Bleriot No. 6 fell from a height of about 75 feet and was so badly damaged that the inventor decided to construct an entirely new machine, embodying several modifications suggested by former experiences.

NEW BLERIOT NO. 7.

The new machine carries an 8 cylinder Antoinette engine of 50 h.p. It has two large wings in front and two small ones in the rear. Those in front have a total surface of 279.5 square feet; those in the rear, 86 square feet. Behind all is a vertical rudder. The manner of construction has not been changed.

The body of the apparatus is of wood, covered with a layer of paper. The body is spindle-shaped, of rectangular section, very sharp in front, tapering to still more of a point in the rear.



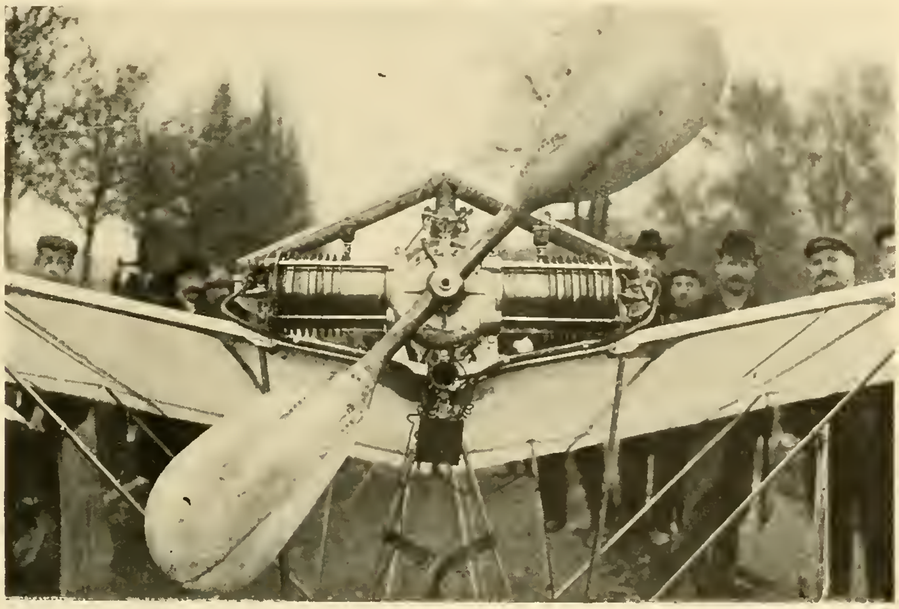
THE BLERIOT NO 6.

The steel and aluminum 4-bladed propeller, with a diameter of 6.88 feet, is located at the extreme front. The length of each blade is 3.28 feet. At 1,000 r.p.m. the pull is from 275 to 285 pounds.

The operator is seated in the interior of the body, with the very ingenious mechanism which operates both the vertical rudder and small horizontal planes at the same time. The total weight of the apparatus, ready to launch, without the operator, is 715 pounds. The body is 22.96 feet long. In the first trial of the machine the rudder behaved poorly and one of the wheels was bent in landing. While the accident was not serious, it sufficed to delay work to some extent.

NEW SANTOS DUMONT AEROPLANE, NO. 19.

This latest aeroplane, which has been nicknamed "The Butterfly," is of an altogether different type from his former machine. The main framework is of steel tubing, mounted on three rubber-tired wheels, two forward and one in the rear, those in front being slanted inwards to receive the machine vertically should it come down sideways in roundng a curve. The supporting surface consists of two varnished silk wings, 16.7 feet from tip to tip and 6.56 feet from front to back, stretched over a



The Automobile

MOTOR AND PROPELLER OF SANTOS DUMONT'S FLYER.

bamboo frame. There is a small horizontal hexagonal plane in front at a level with the wheels and two vertical planes of the same shape on either side of the main frame, under the wings. There is also a combination horizontal and vertical rudder in the rear, mounted on a bamboo cardan-shaft 20 feet in length, fitted with a universal joint. The machine weighs, complete, 113.2 pounds. The 2-bladed propeller is 1.35 meters (4.42 ft.) in diameter, driven by a 2-cylinder opposed horizontal Dutheil & Chambers motor of 17-20 h.p., which weighs 22 kg. (48.4 lbs.) complete.

THE ESNAULT-PELTERIE AEROPLANE.

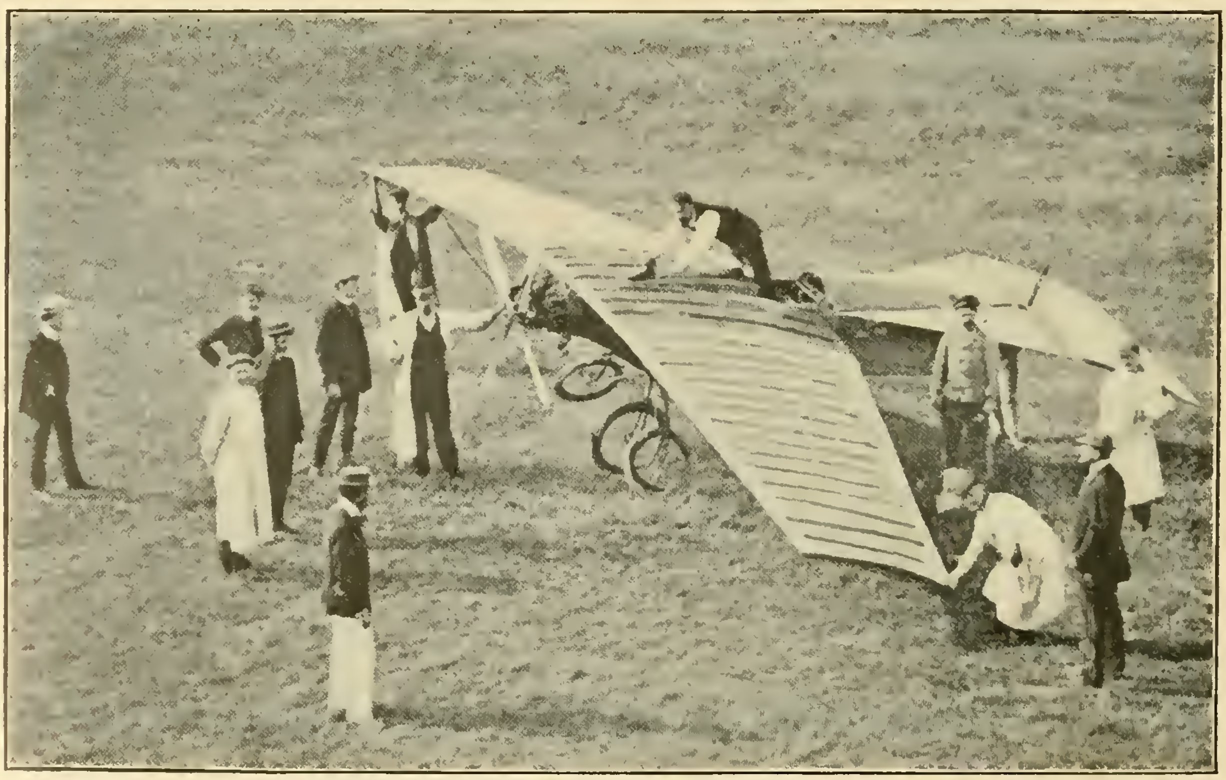
The single plane machine of Robert Esnault-Pelterie resembles very much a butterfly, with flexible wings, mounted on wheels. At the tip of each wing is also a small wheel to prevent damage in case a wing strikes the ground during flight. The total weight of the machine (528 pounds), with operator, is divided as follows: Aeronaut 165; motor and propeller complete with carbureter, pipes, etc., 121; sustaining surface 132; body 44; horizontal rudder 22, wheels and frame 22; gasolene 22.

The 25 horsepower, 7 cylinder motor weighs complete without screw, ready to start, 96.8 pounds, or 3.87 pounds per horsepower. The crank shaft alone weighs 5.5

pounds. The motor was designed in its entirety by M. Pelterie. The motor is perfectly balanced by reason of the number and arrangement of the seven cylinders, which assure one explosion at 2-7 the of every revolution.

The Automobile
PELTERIE'S SEVEN-CYLINDER MOTOR, SHOWING CAM MECHANISM.

For each cylinder each individual valve is governed by a rocker insuring admission and expulsion of the gas. One single cam shaft operates all seven valves. There is one carbureter for a group of four cylinders and a second for a group of three.



THE ESNAULT-PELTERIE AEROPLANE.

M. Pelterie has tried to make light weight by extreme simplicity of parts without detracting from the strength of the motor. In spite of this, the apparatus is solid enough to make 12 trials in two days without mishap.

INTERNATIONAL AERONAUTICAL CONGRESS.

President: PROFESSOR WILLIS L. MOORE.
Secretary: DR. ALBERT FRANCIS ZAHM. Chairman Gen'l Committee: WM. J. HAMMER.
Chairman Executive Com.: AUGUSTUS POST. Sec'y Committees: ERNEST LA RUE JONES.

Publication Notice.

The addresses, papers and discussions presented to the Congress will be published serially in this magazine and at the earliest date possible bound volumes will be distributed without charge to those holding membership cards in the Congress. Others may purchase the volume at a consistent price when ready or may take advantage of immediate publication by subscribing to this magazine at the regular rate.

In accordance with the program as published in the November number, the informal addresses of the Gordon Bennett contestants and others are concluded before entering upon the printing of the formal papers and discussions.

Following will be found the addresses of M. Rene Gasnier, Major Henry B. Hersey and Paul Meckel, their experiences in the Gordon Bennett race and the story of the winning of the Lahm Cup by Capt. Chas. De F. Chandler; followed by the paper of Admiral Chester.

My Voyage in the Gordon Bennett, by Rene Gasnier.

I will try to explain to you a little of the bad luck I had in this race. I started toward the north, until we were almost sixty miles south of Chicago. I was with the other contestants and on the second day I saw two balloons on my right hand, and two balloons on my left hand. In the evening I was very high, at one time almost 1,000 feet. As my balloon was in a good place, I thought I could do nothing but remain there. At that height the current was a little south-east, and when I crossed the Ohio I crossed it about 80 feet under another contestant. I crossed the Alleghenies at a part where the mountains are very high. This was a very good spot, because in the Allegheny mountains I had a good wind. I was, going almost 30 miles an hour. When I crossed the top of each mountain the wind was much stronger, but between each top of the mountains I was going very slowly.*† After having passed the Allegheny mountains, the next morning the sun rose at about half past five or six o'clock, and at that time the wind was blowing in the south; then I went very close to the land with my anchor out, and with my guide rope on the land. I was going southeast. I continued a little while south-easterly and then found myself going to the south. When I saw that, I saw there was nothing to do but go further down, and I came down and landed in a field at half past six. I was sorry not to go further as when I landed I still had nine sacks of ballast.

**Prof. Willis L. Moore.*—When Mr. Gasnier said he moved slowly between the mountains and swiftly when he was over the mountains, I thought it was the principle of water flowing over a dam. Probably that accounted for the swift velocity that he got passing over the top of the mountain, and not very far from it; and when he came over the valley, he encountered a much less velocity of the wind, for the air that carried from over the mountain top went down the mountain side, and he passed on out of it into a lower stratum of air. This is simply a suggestion that came to my mind.

†*Prof. A. Lawrence Rotch.*—I am glad the President brought out this suggestion. It is true, as we found by experiments we made near Mt. Washington last summer. The observations made on the summit of Mt. Washington indicated a very considerably greater velocity than from a kite which floated at the same height over the adjacent valley. How high this velocity continues one does not know. Certainly on a mountain top itself the velocity is very much greater than the velocity in the same height of free air; and I think the suggestions, of Professor Moore are the correct ones, that the velocity is increased just as in the case of water flowing over a dam.

The Trip of the United States, by Major H. B. Hersey.

I am sorry I cannot tell a better story but I just did the best I could, and will tell you a little about it. In the first place, I want to add my testimony to that of Mr. McCoy, in regard to the management of the race as a whole. You must all remember that this was the first balloon race ever held in America. To our French brethren it is an old story. They have their aeronauts thoroughly trained, their attendants for filling balloons, that are filled thousands of times, and it is easy work for them from long experience. Every year in Paris several races, national or international, are held, but here in America this was our first attempt, and I think, under the circumstances, that our foreign competitors will agree that we did very well in getting the balloons filled promptly with a good quality of gas, and getting them off on time without any accidents or disasters of any kind.

I think that the management of this race should be very highly complimented and congratulated on the thorough and efficient way in which they did their work, especially Mr. Stevens, who had an enormous job on hand, and while thoroughly familiar with handling balloons, he was not familiar with handling races. Captain Baldwin lent his assistance in every way possible and altogether I think it may be considered a wonderfully successful race from every point of view.

The balloon which I had charge of, the United States, the same one which I assisted Lieut. Lahm in managing last year, was the second one to go up. We went up a little lighter than I would have liked, so that we attained a height of about 900 metres before stopping, and took a course very nearly northwest. This gradually shifted a little more to the north. Two of the balloons, Monsieur Le Blanc's, and the Pommern, the German balloon, we could see for some time; the German balloon especially, as it was quite high. We crossed the Missouri River just about dark and were gradually working down to the guide rope. A short time later we crossed the Mississippi near the mouth of the Illinois. By this time our course was very nearly due north. We passed between the Illinois River and the Mississippi, close to the Illinois at times, at one time passing over it, our guide rope touching the water occasionally. A little motor launch was coming down the river and we hailed them and asked about the place and the distance from St. Louis and had quite a little chat with them before we passed out of hearing, asking them to telegraph the Club at St. Louis, which they said they would do.

During the night we kept down, the guide rope touching occasionally, hitting the tree tops, and we drew pretty near a straight line north passing Galesburg. We could call the people all night long to know exactly where we were. At different points we could inquire of someone, and then by keeping to our directions, we knew about where we should be, verifying it every time we could hail someone. The altitude was from 300 to 500 feet. Our guide rope was about 300 feet long and it would occasionally touch; but most of the time it was off the ground. At Macomb, Ills., we hailed a freight train crew lying on a siding waiting for a passenger train to pass, and got our location there; and at several different places up through the state we would find some one. In one place we spoke to the manager of some manufacturing plant where there was quite a high smoke stack, and asked him what place it was. He said: "Macomb; but don't run your damned old balloon into this smoke stack."

The night passed rather pleasantly but toward morning it was rather cool. I was dressed quite warm, but my companion, Mr. Arthur T. Atherholt, did not follow the advice given him and suffered considerably from the cold.

About daylight we were passing over Northern Illinois, going east or nearly east. We knew that we must be, from the last station picked up, nearly to the Wisconsin line. Finally we came to a place called Crystal Lake. There were two or three places with a "Lake" attached to the name. Then Lake Michigan came into view. There was quite a nice little town on its shores but we could not quite make it out at first. There was a peculiar looking large building and as we swung along over it we called out, but could only get the last word, "City." It was a short

name and finally we got it: "Zion City," and knew we were passing over Brother Dowie's headquarters. I threw down some cards there for telegraphing in and then we went directly over the lake, with the sun just coming up in the East. We gradually rose, very steadily, going to about 1,500 metres from the lake, and crossed it more than 30 miles an hour, pretty nearly straight east: just a little north of east at the beginning, but the latter part of the distance straight east.

We had crossed Lake Michigan and were able to pick out most of the places that we passed. Sometimes we were too high to call down and verify, but then with our map we would draw our pencils across the places that we passed, and afterwards found them to be correct. We finally crossed Michigan, from Lake Michigan to Lake St. Clair. In passing along there we averaged 40 miles an hour, making careful measurements on the map. In crossing Lake St. Clair we could see Detroit very plainly, in fact, we passed over its northern suburbs.

Right across the centre of Lake St. Clair we went, making, according to our map, 50 miles an hour. Our course then bore a little more to the southeast and we went straight for Lake Erie. We had used a great deal of ballast keeping our equilibrium, or trying to keep it as nearly level as possible, but I felt that we had a good chance of crossing Lake Erie all right and heading for New York on our course. We had reached the eastern end of Lake Erie, on the south shore along about Dunkirk. The sand ballast being the most easy to handle, I began throwing away our spare provisions, water bottles, and things like that. The sun was very low when we went over Lake Erie and the gas was cooling somewhat rapidly. We got down nearly to the lake and had come down to a lower strata when quite suddenly we changed to the northeast, and struck for the Ontario shore, reaching it about half the length of Lake Erie. There we came down rather low, but kept up to probably 1,000 metres. There I threw out some ballast. I was trying to gain an equilibrium —our course bore to the East—before reaching Lake Ontario, because one never knows how much ballast it will take to establish that equilibrium at night as compared with day. At one time a change from night to day may take 10 to 15 sacks of ballast, and at another time but 5 or 6. When once you get that equilibrium, usually two or three sacks will take you a long way; but in the change from night to day the cooling of the gas is very uncertain, and it is indefinite as to how much will be needed. I got down a little too low trying to get this and the guide rope stuck in a wire fence, bringing the balloon down some distance, so that, while it tore loose from the wire fence—tearing out one strand of the guide rope—it put so much of it on the ground, that the friction of the rope from holding in that strong wind, dragged the balloon down. We had to throw out a large amount of ballast to get the thing loose. We struck up very rapidly. We got near Lake Ontario, and I knew when it came down from any height it would take a good deal of ballast to stop us. We only had eight sacks left and I did not think it wise to attempt going the length of Lake Ontario at that time of the night. I still believe I did what was right.

Of course, when I found out that at the rate I was going, by one o'clock I could have beaten the distance made by the Pommern, I felt as though I should have liked to have kept on longer; but my basket was not prepared with any safety arrangement at all. Several of the balloons had their baskets lined with cork, inside and out; the German balloon especially. If it fell in the water it would keep floating a good many hours but I had nothing of that kind. My companion agreed with me fully and thought it would be unwise to go out on the Lake in that condition; so we pulled the valve cord, let out some ballast and came down. It became dark, and we made a very good landing,—a mere matter of luck, because we could not tell where it was. We struck in a ploughed field, that had been ploughed some days before and was entirely dry. We cut loose the anchors and came down. I hardly felt the jar as the basket struck the ground, and I pulled the ripping cord. The anchor hook caught into the soil and held and the balloon was deflated almost instantly. We made a very nice landing.

The balloon landed with the end within six or eight feet of the fence, along which a road passed. A moment or two later a farmer came along in a wagon, and we enquired if we could get some one to help us. He said he had to go eight or ten miles further but he would take us along to the next neighbor, who, he felt sure, would help us through. He drove us about a quarter of a mile over to this farm. We reached there just before supper and the man invited us to take supper with him, which invitation we were very glad to accept.

We had had a rather busy time and had not eaten regularly in the balloon. He gave us a nice supper of farm things; plenty of good milk, hot biscuits, etc., then the whole family turned out to help pack the balloon. The farmer hitched up his horse and buggy and took us into the nearest village, about seven miles from there, so that we could telegraph our landing; and the next morning we brought in the balloon. We shipped it back to Mr. Stevens. Mr. Atherholt took a train for Philadelphia and I took one for Milwaukee, arriving home that night.

I am very sorry I did not do better than I did; but in view of it all, I do not feel that I made any mistake.

I kept low during that night to try to get as far north as possible, because I felt sure the next day's tendency would be to go to the southeast, and I wanted to get to Maine or some place in the East. If I had continued our course across Lake Erie and over New York State, we would have stood a very good show of being well up in the front. But as it was, we took the luck we had, and certainly we congratulate the winners on their success, and all of those engaging in the trip, on a most excellent and memorable flight. I cannot say positively, because I never read thoroughly of all the races, but I doubt very much if there has ever been a balloon race held in the world in which as many balloons made as many miles as they did in this race. That is, in which nine balloons made as many miles as the nine balloons in this race did. It may be that it has been done before, but I don't think so. We have had one of the most successful races ever held.

The Story of the Abercron, by Paul Meckel.

I can only say that I think the other German aeronauts are glad to be here and we all wish to thank all of you for the very nice arrangements we had; especially for the very nice reception we had in St. Louis on the part of the aeronautic club, and from the members of the German Club, and the other gentlemen there. I am very glad that we will have the occasion next year of receiving you in Berlin for the third competition and we will do our best to make very fine weather for you, and we hope a good many of your members will come over and see it.

Of the arrangements at St. Louis, I can only tell what I know of my own experience. It was not the first time I had taken part in an international contest, and I must say that the others and myself were very much pleased with the arrangements. The gas was excellent and the whole arrangement very good. What we did not like very much, for instance, was that the gas was stopped at noon, and did not come on again until 4 o'clock, so that we could go on again with the filling, but, of course, it was your first time and there were so many balloons in St. Louis. Mr. Erbsloh told me that you had not had experience in filling so many balloons. I must say that the gas was excellent. I never saw such a thing before, being only lighting gas. We were very much astonished at that, to find that we came into the second night with such great facility, and we had no trouble at all to keep the balloon at a steady height; even the first night, but especially the second night. We went from a height of about 10,000 feet down to the next height, of about 800 feet, without dropping any ballast, and the balloon got its equilibrium that time and went up higher later on, about 1,600 feet, and kept there, without dropping any ballast, or the opening of the valve. It kept at the same height during the whole night, and I regretted very much to be obliged to land the next morning, because

we saw water and I thought it was the ocean. I must say that it is not very complimentary to you, but your maps are not very good. We had the topographical map, and the postal map, and the railway maps, and everything we could get.

We had very good speed on the second morning, just before landing—about 50 or 60 kilometres an hour, so that it was impossible for me to make any inquiry from the people; especially because I had my guide rope down. It made a very great noise and we could not understand any answer from the people; otherwise I could have found the situation, just as I did the first day. When you know where you are, then, of course, in a State like Ohio, or the surroundings of St. Louis, it is very easy to know your situation, because you can then see your railways; when you have lost that thing, it is very difficult to find the situation then, because on these maps there are only the towns and the railways, and nothing else. The streams that we encountered were not there. It was very difficult for me on the second day and so I thought it was necessary for me to land, because I saw the whole surface of water, and the small sailing craft on it. Then, of course, I did not know it was the Potomac River, which it really was, and thought it was the Ocean. I had a very good excuse to land and did not go on.

My balloon was the smallest of its kind in the race. It held only 1,437 cubic metres and all the others had 2,200, almost twice as much, and I started with 14 sacks of ballast. All the others had more, one starting with 41. I could have gone on at least 100 miles further. After landing, I had 2½ sacks, and while landing I used two sacks, just to come down more slowly. I could have spared it and not used one sack. The shock would have been only a little bit harder. Von Abercron could have gone on 500 miles.

It was very interesting, the first night going over the Alleghenies. We sometimes went from 200 to 300 feet above the summits of the mountains. We crossed very pretty valleys and could see these hundreds and hundreds of coke ovens. It was extremely interesting to see this wild scenery, especially after the first day. The first day it was not so interesting, because your cities are quite square and I did not use the compass at all, and I saw the land just going from east to west. We did not feel on the second night so much cold as on the first night, although we were higher. The second night we were 1,600 metres and the first night about 800 metres.

The whole arrangement was excellent. I can congratulate you upon the whole affair.

The Winning of the Lahm Cup, by Capt. Chas. De F. Chandler.

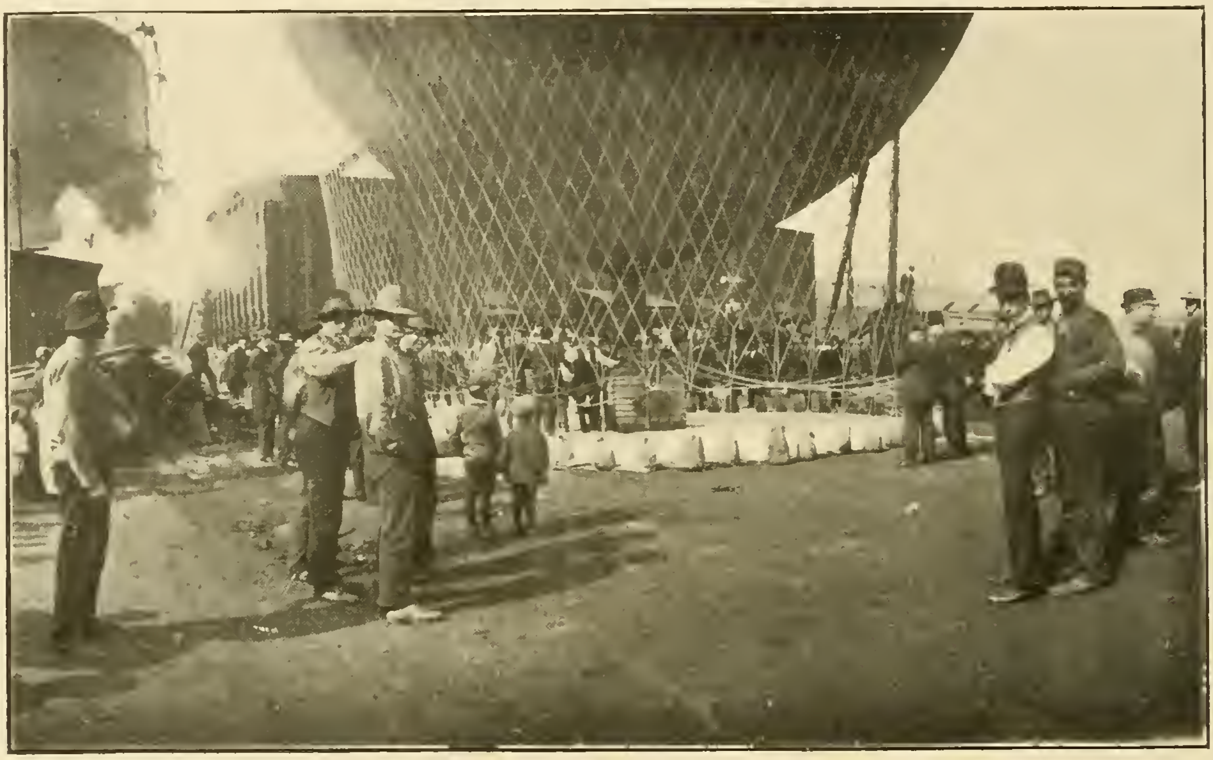
Mr. McCoy and I were without experience as compared with our foreign competitors and we thought we would like to have a preliminary trip. I thought the best thing to do would be to enter for the Lahm Cup, even if we didn't get it. We didn't say anything about it beforehand, except to certain individuals. We arrived at the gas works late in the afternoon and finally got away with a good breeze—eighteen or twenty miles an hour—and went up to the northern part of Ohio, turning to the southeast, and then down into West Virginia. The first night was unusually warm; I don't expect to experience another night like that in a balloon. We did not even put on our overcoats.

That night we stayed pretty low. We talked to the farmers all along the way, and found our course from these towns and from various cities which we recognized. About one o'clock in the morning, we did not know just where we were and called out in the megaphone, getting an answer from some farmer. We asked where we were. He said "Hendricks County, Indiana." We were just a mile north of Indianapolis and saw the lights of the city. Keeping that same altitude, the wind shifted to the southeast. I don't know why it should do that at that altitude.

One peculiar thing about the sounds that night was that the chickens, ducks, etc., made a great noise, when the balloon was going over. They seemed to discover it, and I think that was why the farmers got out—they thought somebody was in

their chicken coops. They did not always discover the balloon, and when they did, the first question they asked was, "where are you going?" but we did not know, ourselves.

Occasionally shots were fired at the balloon—we must have had twenty or thirty fired at the balloon. A great many farmers did not seem to understand what the balloon was. One man in West Virginia expressed himself in very forcible lan-



THE START FOR THE LAHM CUP.

guage in inquiring what that was up in the air. This was in the day time, too.

After we crossed the Ohio River—it was a pleasant day—we were headed just about for Charleston, West Virginia, and we thought that would be a good place to land and get a train back to St. Louis. Many of our friends, when we started, were very solicitous and thought we would not return in time for the international race. We expected to come down near Charleston, but about twenty miles from there the wind changed and took us up towards the northeast. We went further into the West Virginia mountains. We knew we would be a long time in getting out and decided to get down as soon as possible. We found by the map that we had exceeded the 402 miles made by Lieutenant Lahm, and had made 475 miles up to that point. When we landed we had about one-third of our ballast left.

As it was, we got in a very bad place in the mountains. It took us 24 hours to get to the telegraph office. The roads were very bad. Part of them were down in the bed of the stream and the driver who undertook to haul the balloon, stated it would take us two days to get to a railroad station. We could not travel at night at all. Finally we got back to St. Louis, arriving there Sunday morning, a day before the race.

THE AIRSHIP OF THE NAVY.

The Heavier Than Air Machine.

By Admiral C. M. Chester.

In all the discussion that has gone on during the past year, which has been an eventful one in the history of aeronautics, there is no small amount of material for thought, regarding its application to military service. While the Navy

generally, comes under this classification, it has such a distinctive field in military science, that the usual treatment of the theme does not meet these distinctions.

Writers who are competent to discuss such matters from a naval standpoint, are limited in number. None but seamen who have become familiar with a seafaring life, and understand the varying moods of the ocean and its enveloping atmosphere, can treat the subject understandingly. As a rule, such of our officers who might take up the study of aerial navigation, are at present so actively employed far away from points on terra-firma where experimentation with airships is usually made, that the opportunity has not yet arisen that should definitely bring this subject before the Navy. Some experiments with airships which took place at the Jamestown Exposition during the past summer, gave a few officers, who were stationed there, a chance to note some of the possibilities of aerial navigation for naval purposes, and it is understood they were deeply interested.

They were at least agreed, that the Navy could not too soon add the art of aerial navigation to its list of requirements, if it is to maintain its standing as a leader in naval science.

A number of foreign navies have gone into the subject of aeronautics quite elaborately, but as little of their work has been allowed to be made public, we are not permitted to know what may be expected from their investigations.

Quite recently, however, brief articles accompanied by pictures have been published, indicating that captive balloons have actually become a part of war equipments of the Austrian Navy. Furthermore, some of the secret history of the Russian-Japanese War, which has gradually come to light, shows that not in the Army only but in the Navy as well, captive balloons have been used to good advantage as scouts.

For instance, it is learned that one of the Russian cruisers of the Vladivostock Squadron, which committed so much havoc among the Japanese transports and merchantmen during the late war between those nations, had installed on its decks a captive balloon, with which, fully inflated, the ship made more than one examination of the coast of the island of Nippon without being seen.

While the information thus brought to light is meager, sufficient is learned from the reports of actual practice to substantiate what theory has heretofore pointed out as fact, that the airship is likely to become the long sought for antidote against attacks from submarine vessels. The elevation which the airship attains enables an observer to take, gives him a means of discovering the movements of the submarine vessels under water, and floating mines and stationary mines submerged much beyond the draft of a ship, may be detected.

The seaman, from time immemorial, has used the mast head of his vessel as a lookout station from which to pilot her through the intricate coral channels of the tropics, the light color of the coral formation making it easily discernible, even from this slight elevation, but the greater elevation possible from a balloon enables an observer to see the characteristics of the bottom in not too deep water even though its color may nearly accord with that of the water.

Such knowledge as this, will at times be worth a fortune to a naval commander, and it must be agreed that if he is to reap much benefit from the subject, the naval man should take his share of the work and the expense of developing the art of mechanical flight as a military measure. Many officers of the Navy would like to study aerial navigation, and I may say there is no class of people in the country better qualified, by education, mechanical ability, and experience allied to the subject than are the officers graduated from the Naval Academy. It is to be hoped that the authorities may see that the matter is of such importance as to warrant the establishment of an Aeronautic Corps, as has been done in all the principal armies of the world, as well as in the Russian, Austrian and, as I believe, other navies of Europe.

The event which has brought to our shores this year a Congress of eminent

men, was the winning by us of the aeronautic trophy, for which the representatives of the leading nations of the world competed, and which they came here to recapture.

The race was won on scientific principles that are perfectly familiar to seamen, and their application at the time of the last international race in Europe last year might well be termed a "seamen's trick," such as occurs in nearly every ocean race,—viz., the taking advantage of the laws of storms. Any day that presages a coming storm, here, you may see hundreds of vessels at anchor on the beautiful waters of Hampton Roads, waiting "till the clouds roll by", and the storm has passed over until its southwest quadrant overlies our Atlantic coast. Taking advantage of the cyclonic character of the storm, with the wind in their favor, they spread their sails and proceed to the ocean, with the assurance of a safe and quick trip to their destinations in the south. This is like unto what Lahm and Hersey did in the balloon race of last year, when they put their ship in the quadrant of southerly winds low down in the atmospheric sea, rather than seek the higher altitudes their competitors took. By so doing they were carried north from Paris to England, and reached the "farthest north" of that little island, and thus won the cup against seventeen competitors. This was old time navigation, but it was done with an old time airship, as the balloon is and, as the result showed, fitted the conditions of the occasion.

The aeroplane on the other hand, cannot be left to the will of the wind, but must plough through the air overcoming the forces of the wind in the direction of the goal, rather than do, as has been done in the past, both in ocean and aerial navigation, set the sails and let nature do the rest.

No one factor in the problem of mechanical flight has been so important to the solution of that problem, as the introduction of the explosive engine, which is now also becoming one of the prime factors in designing the war ship of the future.

While the aeroplane must be heavier than air, it is evident that its weight should not be so great as to destroy its buoyancy, under the conditions of motion, which its motive power must give.

Formerly, the weight of the machinery of a vessel was much greater in proportion to the displacement than it is now, otherwise it would be impossible to secure the high speed of our trans-oceanic liners without sacrificing so much of their carrying capacity as to make them unprofitable to navigate. So in the flying machine, the evolution of the engine presages our success in mechanical flying.

In 1894 Sir Hiram Maxim flew an aeroplane weighing five tons, a distance of 400 yards. His engine was driven by steam generated from naphtha fuel, and had a weight equivalent to 10 pounds per horse power. Santos Dumont's aeroplane is motored by explosive engines weighing only 2 pounds per horse power, and it is claimed that airship machinery weighing but little over one pound per horse power is possible of construction.

Thus in the evolution of the hydro-carbon engine, has the weight of machinery been reduced to one-tenth of what it was a few years ago.

The dirigible balloon is now part of the equipment of nearly all the armies of the world, but, as already stated, it is not a machine profitable for general use on shipboard, and naval men should give their attention to the development of the aeroplane, which is peculiarly a naval weapon, and opens great possibilities for utility. Some features showing the adaptability of the aeroplane for service on board ship, I would itemize as follows:

1st. Its compactness.

2nd. Its location near to a machine shop.

3rd. Its adaptability for scouting purposes.

4th. Having the power at hand for initial movement.

In explanation of these points I would state:

1st. A few months ago it was my privilege to examine the laboratory of that

indefatigable worker and enthusiastic scientist, the Prince of Monaco, what might be styled a mechanical bird, which was not much larger than its natural prototype, the albatross.

The whole mechanism of this wonderful contrivance, so simple and yet so convincing that I said at once, "therein lies the secret of the naval 'Bird of Prey.'" I have not yet heard that it has flown, but one feature of the machine, which I recognized as having been introduced into our own naval architecture many years ago, with such marked success that I was led to hope the result might lead to a speedy solution of the problem. The compactness of the Monaco invention suits it particularly to naval conditions.

2nd. Probably no factory in the country is so well fitted to make small repairs to machinery, and has such a variety of mechanical skill to use it, as a battle ship. Such a machine shop, is, therefore, always at hand for the repairs and adjustments of the parts of a Navy airship, without which no mechanism can be kept in order.

3rd. Lord Nelson, when chasing the vessels of his arch enemy, Napoleon, in the early part of the last century, said that what he missed most in the composition of his fleet was scout vessels, which he properly styled "the eyes of the fleet." It is only necessary to read of his campaigns in the light of this expression, to appreciate what an advantage a small, compact aeroplane, carried by each of his ships would have been to him. An observer, raised in an airship above the ocean, may not only extend his view over the water but the sea may be made to give up some of its secrets. This last factor in scouting is of more importance now that we have the submarine to deal with, than was the search for an enemy in Nelson's day.

In actual war, then, the naval "Bird of Prey" may be launched into the air from a battle ship and give timely warning of an approaching enemy. Just as the balloon acts for the army on shore, and swooping down destroys them very much as does the albatross upon her living prey in the sea.

4th. The greatest difficulty to be overcome in the problem of mechanical flight, is providing suitable means to give the airship initial motion. Langley, for instance, built an airship, which all now recognize to have been upon right principles, and his model did, in fact, fly, but his plans came to naught as far as the machine itself was concerned owing to defects in his launching ways. Mechanical flight is only possible when a momentum through the air is acquired of about seventeen and one-half miles per hour. As the machine must start from rest, some means to produce movement, outside of itself, must be had before its own motor can act with sufficient power to attain this speed. It is commonly done down an inclined plane. This may readily be constructed on board ship, but generally the ship's own headway through the air may be sufficient, and herself become the launching platform. If her engine will not drive the vessel that fast, it will only be necessary to steam her head in to the wind, when a relative speed through the air will be gained equal to her own advance, plus the rate of the wind in the opposite direction. Thus, by a simple movement of the helm, the ship may become the launching platform for the aeroplane.

One thing is certain, any design for an airship will be of little value until it has become so mechanically adjusted as to be able to overcome all conditions of the atmosphere that militate against its flight, and as these conditions are chronic, perpetual treatment is necessary. The doctors are always at hand on board a man-of-war, with suitable remedies to mend the breaks.

Instances might be multiplied, to show the possibilities of the aeroplane in connection with naval conditions, but it seems needless at this time to say more, in order to indicate of a serious study of aeronautics as applied to the Navy, and to the development of a machine that promises so much as a war implement.

May we not also hope that the men who have done so much for the development of the flying machine, and who are still earnestly and patiently working for its practical perfection, may, in the spirit of patriotism, be led to give to our Navy,

the benefit of their experience, and with its officers, help to bring to the service of their country the result of their labor, which shall become a new and wonderful ally to the battle ship, in the future conflicts of the sea. Until the dawn of that more glorious day, which we all hope to see, when, through the efforts of our International Congress of Peace, "the bird of prey" may be transformed into the dove that bears "the olive branch."

NOVEMBER ASCENSIONS.

Everyone making balloon ascents is requested to send in to this office as full a report of their trip as possible.

Nov. 5. Messrs. A. Leo Stevens and Charles J. Glidden (A. C. A.) in the "Stevens 21" from Pittsfield, Mass., 10:46 a.m., landing at North Springfield, Vt., at 2:12 p.m. Highest altitude reached, 8,200 feet. Elapsed time, 3 hours, 26 minutes. Distance, 71 miles. This makes two ascents for Mr. Glidden.

Nov. 9. Messrs. A. Leo Stevens (A. C. A.) and F. H. White in the "Stevens 21" from North Adams, Mass., 12:10 p.m., landing at New London, N. H., at 5:05 p.m. Highest altitude reached, 7,000 feet. Elapsed time, 4 hours, 55 minutes. Distance, 74⅝ miles. Cold. Passed over snow-clad mountains.

Nov. 9. Messrs. Oscar Erbsloh (D. L.-V.), Dr. J. P. Thomas (A. C. A.), Mrs. Thomas, Capt. T. T. Lovelace (A. C. A.), Lt. Robert Henderson, U. S. N., and Dr. Rudolph Erbsloh in the "Pommern" from Philadelphia, Pa., landing at 175th Street, New York. Distance, 97 miles. New York was announced before starting as the objective point.

Nov. 14. Dr. T. Chalmers Fulton (Ben Franklin A. S.) and Major William S. Lloyd in the "Initial" from Philadelphia, Pa., at 2:05 p.m., landing at Port Republic, N. J., 3:42 p.m. Elapsed time, 1 hour, 37 minutes. Highest altitude 8,400 feet. Temperature at start 46° F., at highest altitude, 23.4° F. Distance, 56 miles. Start made in high wind, which continued. It was necessary to use the rip-cord in landing as the anchor would not hold in the sand.

Nov. 15. Messrs A. Leo Stevens (A. C. A.) and James F. Lord in the "Stevens 21" from North Adams, Mass., at 11:01 a.m., landing at Fremont, N. H., 4:15 p.m. Highest altitude 1,500 feet. Passed through snow storm. Elapsed time, 5 hours, 14 minutes. Distance, 103 miles.

Nov. 17. Hon. C. S. Rolls, Lieut. Frank P. Lahm (A. C. A.), Lord Royston and Mr. Bernard Redmond from Chelsea, England. It was planned to land as close as possible to the country house of Mr. Claude Crompton. The wind was favorable and the landing was made within a few hundred yards of the house half an hour before they were expected.

Nov. 19. Messrs. A. Leo Stevens and A. Holland Forbes (A. C. A.) in the "Stevens 21" from Pittsfield, Mass., at 12:35 p.m., landing at Milford, Ct., at 4:15 p.m. Highest altitude reached, 11,480 feet. Elapsed time, 3 hours, 40 minutes. Distance, 83¾ miles. Landing made in high wind and balloon dragged considerable distance. At the high altitude the heat was excessive.

Nov. 21. Messrs. Charles Walsh and John D. Larkin, Jr., (A. C. A.) in the "Initial" from Philadelphia at 2:45 p.m., landing at Milford, N. J., at 4:42 p.m. Highest altitude, 2,200 feet. Temperature 70° at 1,600 feet, 40° at 1,700 feet. All the trip in and above clouds except during occasional descents to get location. Elapsed time, 1 hour, 57 minutes. Distance, 47¼ miles. This trip completes, for Mr. Walsh, the ten necessary to qualify as a pilot.

Nov. 25 Messrs. A. Leo Stevens, J. D. Larkin, Jr., L. M. Taylor, A. H. Morgan, J. H. Wade, A. Holland Forbes (A. C. A.) and F. H. White in the All America from Pittsfield, Mass., at 10:55 a.m., landing at Canterbury, N. H., at 4:30 p.m. Distance, 103¾ miles. Elapsed time, 5 hours, 35 minutes. Highest altitude, 12,976 feet.

Nov. 29. Mr. Frederick H. White in the "Stevens 20" from North Adams, at 11:03 a.m., landing at Fitchburg, Mass., at 3:15 p.m. Elapsed time, 4 hours, 12 minutes. Distance, 73¾ miles.

CHRONOLOGY OF PRINCIPAL EVENTS.

November. 5. After numerous attempts M. de la Grange left the ground for about 150 feet, after a run of 600. He made a false movement with the steering apparatus and not having time to correct it the machine was dashed to the ground and wrecked, with the exception of the motor. Farman was at the other end of the field, ready for a flight, when the accident occured. He started flight at once and arrived on the scence earlier than most of the automobiles.

Nov. 6. The Bleriot No. 7, while running on the ground, skidded, crumpling the frame and damaging the left wing. Propeller struck the ground at high speed and crushed it. Bleriot kept his seat and was unhurt.

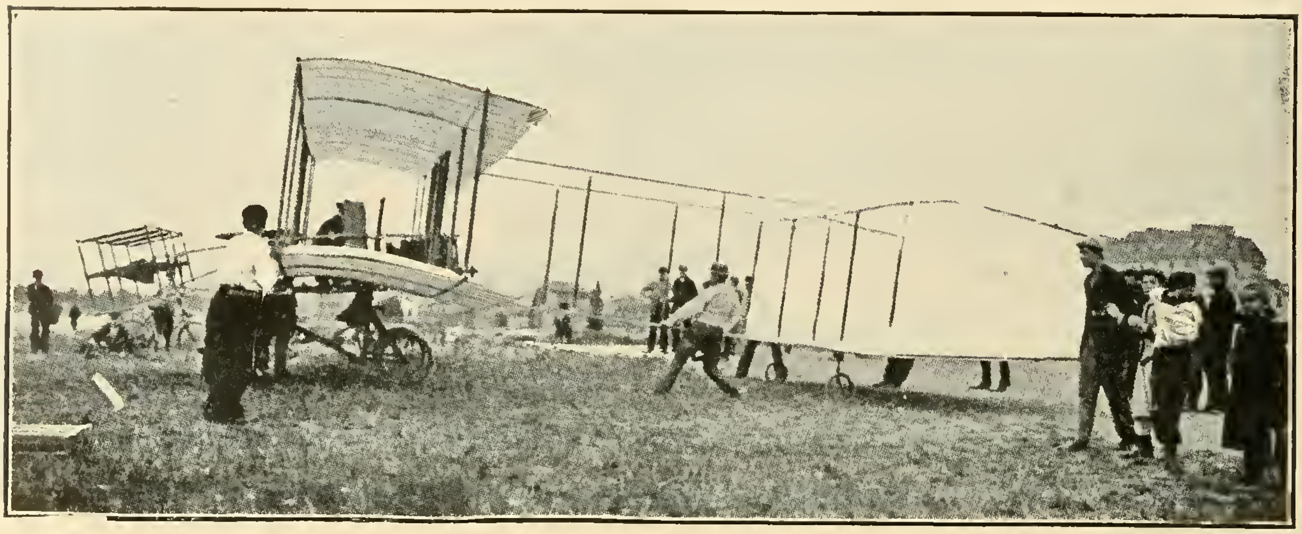
Nov. 1-3. Dr. Kurt Wegener, in the balloon "Ziegler," of 1437 cubic meters, made a trip from Rheinfelden, Germany, across the English Channel to London in 40½ hours. The balloon was held in readiness and let go during the night as soon as the proper wind came. Dr. Wegener holds the world's record (52½ hours) for duration and in this last trip came close to beating the next best record. In the record trip, April 5-7, 1906, he traveled from Berlin north to the upper end of Denmark, and return to Aschaffenburg, to the southwest of Berlin, a distance of, following the course of the balloon up and back, 780 miles.

Nov. 7. Farman twice beat his former record of 771 meters, the longest measured flight being 800 meters (2624 feet), though the second flight which was not measured, was 100 meters (328 feet) longer. He was in the air in this flight 1 min. 10 secs. and was able to steer his machine sufficiently to describe an "S" and landed easily.

According to press dispatches a bill will be laid before the Reichstag upon its assembling, appropriating money for Zeppelin to build the new airship. It is also said the imperial authorities are considering the question of repaying him all the money he has spent in experimenting with airships.

Nov. 8. La Patrie made a circular trip over Paris lasting 4 hours. Distance covered estimated at 140 km. (84 miles).

Nov. 9. After a number of preliminary flights, Farman flew 1 m. 14 secs. at about 10 feet from the ground, over an estimated distance of 1036 meters, during which he succeeded in making a complete circle, returning to within about 40 meters of the start. Subsequently he made some "exhibition" flights, executing various



THE FARMAN AEROPLANE.

curves. Judging from these flights, he will soon win the Deutsch-Archdeacon prize of 50,000 francs, offered to him who shall accomplish first 1 kilometer flight and returning to the start after rounding a post 500 meters away. "At first the machine rolled slowly along the ground, but quickly gathering speed it shot off into the atmosphere at a gentle angle. Once in the air it became evident that Mr. Farman had his apparatus thoroughly in hand. As he gradually inclined the rudder the head responded to the touch. Around came the plane, inclining slightly toward the ground. As the curve became more and more pronounced there was no swaying and the stability of the apparatus did not appear to be affected in the slightest degree by the circular movement.

Keeping the rudder over at a moderate angle, Mr. Farman succeeded in bringing the head of the plane right around until it was bearing toward the starting point. Then he straightened the rudder and started for home at full speed amid the deafening cheers of the onlookers. The flight lasted one minute and fourteen seconds.

When Mr. Farman descended from the machine he was almost overwhelmed by congratulators, among whom none was more enthusiastic than M. Archdeacon, who left the manoeuvring ground convinced that within a week he will be $5,000 out of pocket.

Before dark Mr. Farman accomplished several other flights. The last flight, in the form of a huge "S" down the field, enabled him to demonstrate with what facility he can bring his apparatus to a horizontal position by judicious use of the rudder when for any cause whatsoever the horizontal position has been lost."

Nov. 11. Farman out again and in a heavier wind than usual. He left the ground for a short distance in the first trial. The motor did not respond and the second was no better.

Santos Dumont completed "No. 19." The trials in which it was towed by an automobile proved promising. The engine is now to be installed.

Nov. 14. M. Pischoff practiced with his new machine. The motor worked poorly and only limited speed was attained. In making a sudden turn the apparatus fell over on one wing and dashed into a fence, damaging the propeller and the front portion of the machine.

Farman flew at first start, describing a large semi-circle. Descended to adjust motor. Then made two or three more flights. Suddenly when describing a large circle one of the propeller blades snapped off, striking the ground. It was turning at 1500 r. p. m. but fortunately the propeller broke when the force was directed downward.

The Ville de Paris, after being deflated for 6 weeks or so to allow of various

alterations and the fitting of a new Voisin propeller, sailed over Paris. Traveled against a wind of 7 meters (22.96 feet) per second. The new screw has a pitch of 6 meters 30 centimeters and turns at a maximum speed of 180 r. p. m. In this flight at 140 r. p. m. it developed a speed of 42 kilometers (25.2 miles) an hour. The maximum altitude was about 1000 feet.

La Patrie also out and made a successful ascent.

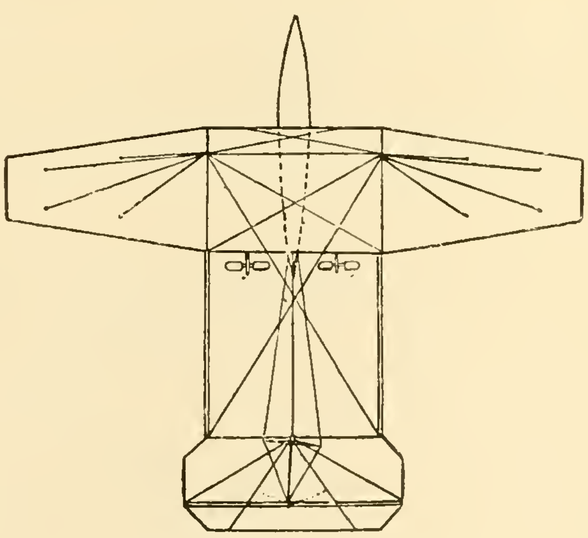
Nov. 16. La Patrie maneouvred near Versailles. Photographs were made of the military manoeuvres below. Navigated at a height of 1,300 meters (4,264 feet) and it was claimed to be out of range of any projectiles which could be aimed by an enemy.

Nov. 17. Santos Dumont made unsuccessful attempt for Deutsch-Archdeacon prize. At first trial did not leave the ground. In succeeding flight he covered about 200 meters (656 feet). During the flights the wheels were damaged but were repaired on the ground. The machine seems to be stable but Dumont lacks skill. The motor worked imperfectly.

Nov. 18. Farman accomplished a kilometer in competition for the Deutsch-Archdeacon prize. The machine touched the ground for an instant twice during the flight; once just before making the turn at the 500-meter post and once just after rounding the post. The return was made to the starting point but by reason of the machine's touching the ground the prize was lost. Orville Wright was present and expressed surprise that the prize had not been won before.

The Ville de Paris, with five passengers, traveled from Sartrouville to Issy-le-Moulineaux where the aeroplane flights are made. After watching Farman's flights, the airship changed passengers, taking on M. Georges Besancon, Secretary of the Aero Club of France, M. Jacques Faure, M. Robert de Rothschild, in addition to the pilot Kapferer and the mechanic Paulhan, and traveled to Montesson at a constant altitude of about 380 meters. The trip from Issy to Montesson consumed 3 hours and 37 minutes.

Nov. 19. Count de la Vaulx tried out his new aeroplane but was thrown from the machine during flight, due to the breaking of a wing, falling under it, the gasoline taking fire.



PLAN OF DE LA VAULX MACHINE.

Nov. 21. The Ville de Paris made another trip.

Santos Dumont made several flights, the longest being from 30 to 40 meters. Just on landing one of the propeller blades snapped off and the machine fell on its side and was somewhat damaged. The motor partially broke loose when the blade flew off. The propeller blade traveled a distance of 120 meters, almost burying itself in the ground. Farman states that he believes the propeller could cut its way through 10 people. The Santos Dumont machine will not be out again for some time.

Nov. 23. Farman competed for the third time for the Deutsch-Archdeacon prize. He made but one flight of 120-150 meters. A violent wind and rainstorm came up and lasted all day. He flew from the shed to the starting point, a distance of 900 meters (2952 feet) and then started on the course. The wind was blowing at 12-18 miles an hour and caught the machine sideways. To prevent being blown

out of the field descent was made. "In the squalls which repeatedly struck the machine Mr. Farman showed great presence of mind, and was able by judicious use of the rudder to keep the apparatus on a tolerably even keel. At times the angles assuredly appeared alarming, but by keeping the motor working, contrary to the practice of most aviators when in difficulties, Mr. Farman endeavored to make the huge plane obey him. His success was loudly praised by experts."

La Patrie sailed from Paris to Verdun, with four men aboard, 238 kilometers (142.8 miles) in 7 hours and 5 minutes, a mean average speed of 20.4 miles per hour. At the Eiffel Tower a wind blowing 11 meters a second was encountered. November 30th a sudden violent gust of wind tore the airship from the grasp of the soldiers at Verdun and was last reported as having come to earth in Ireland. There were conflicting reports as to whether anyone was on board the ship or not.

THE AERO SONG.

Dedicated to the Aero Club of America.

By A. Morrison.

Come ye who dare to plow the air,
This glorious summer weather,
And by balloon,
        This afternoon,
We'll sail the blue together.

CHORUS.

In Cloudland! In Cloudland!
Oh to rise! And Soar!
As a bird, evermore,
Thro' skies of pearl and rose and gold,
To mount the way,
        That leads, they say,
To Paradise!

Sure nothing quite yields such delight
As to be free of tether;
And land or sea,
        What can there be,
Like cruising thro' the ether? (Chorus.)

Where we can rise in grand emprise,
All worldly empire ending;
And, as we float,
        In passing note,
The vesper star ascending. (Chorus.)

So here's a song, for those who long,
To voyage 'round the planet;
That voyage thro'
        Empyrean blue;
And nothing now to ban it! (Chorus.)

Where sea mews wing and skylarks sing,
And naught is that annoys us,
A bark sans keel,
        A car sans wheel,
Our aero-mobile will poise us! (Chorus.)

Then while we may, come love, away,
Beyond Earth's grossness drifting;
Where hearts are thrilled,
        And souls are filled,
With a divine uplifting! (Chorus.)

NOTES.

The Springfield, O., News of November 3 contains an interesting article on aeronautics comprising the ideas of Mr. John Bryan, of Riverside, Ohio. In one place Mr. Bryan states:

"Up near Yellow Springs, Ohio, where I sometimes reside on Riverside Farm, we have two little black jackasses. We have a pack-saddle resting upon a light frame support just quite touching but not resting upon Jack's back. We now load three two-bushel sacks of wheat upon the pack-saddle. The three sacks of wheat weight 360 pounds. We now strap the pack-saddle to the asses' back by broad, easy bands around his belly.

"We then attach the cords of a captive balloon or gas bag to the top of the pack-saddle or load. The balloon's lifting strength is 400 pounds; that is, it lifts the 360 pounds load and 40 pounds of the jackass. That jackass now steps off with the 360 pounds load and 40 pounds lighter than he could walk on his own legs without it. Nathan Clark, a 12-year-old boy, leads the ass away to the grain elevator at the village; or by increasing the lifting power of the balloon by putting in a little more gas, Nathan can ride the ass and the ass not have any increase of load. The ass only guides the balloon and affords such slight propulsion as it needs."

Mr. H. H. Clayton, who accompanied Erbsloh in the Gordon Bennett, addressed the meeting of the Boston Scientific Society on November 12, the subject being "Scientific Aspects of Ballooning," illustrated with lantern slides of the race. Mr. Clayton concludes from his experience in the Pommern that unless interfered with by local mountains or currents induced by them, it would be possible to land a balloon at any prearranged point. The Pommern was diverted from this course by natural obstacles in western Pennsylvania, and so came to New Jersey. With a better knowledge of the country and with a little experience he believes that the run could have been longer, since on landing they had about one-third of the ballast remaining.

While aloft Mr. Clayton made a number of interesting meteorological observations. He found a daily change of wind that he did not know of before. The practical effect of this was that the track of the balloon was not a straight line. The change in the wind drove it in a zigzag. Compared with the other balloons the course of the Pommern was very straight, but there was in it this divergence which experience might perhaps eliminate.

The Pommern went 953 miles to make a line of 876 miles and arrived at its limit on the coast four and one-half hours ahead of its nearest competitor, the French balloon of Le Blanc. The other balloons were, however, nearly at the end of their resources, while the Pommern had ballast enough for another twenty four hours. The descent was made necessary because the balloon was at the edge of the ocean.

The Buckwalter Airship Co., of Loudonville, O., has been incorporated to build airships that will "carry passengers."

The Spanish Government has recently purchased a drachen-balloon for military use. During the week of October 2 it made a flight in the presence of King Alfonso.

On Top of the Stage Coach. "What a clear view! Not a single airship in sight!"—*Jugend.*

Mr. Frederick H. White will deliver a lecture on ballooning, illustrated with slides and motion pictures, at the Y.M.C.A. in Boston on December 19th. The affair is being held under the patronage of the Aero Club of New England.

Another Frenchman, Julien Arbin, of Meaux, has plans for a helicopter which he claims will travel as slow as 10 miles an hour. The framework is to be 32.8 feet in length by 9.8 feet wide. Ten 10-foot horizontal propellers will be driven by a 100 hp. motor. The total weight, including two passengers, one at the motor and one at the rudder, is calculated to be about 2640 pounds. The cost is estimated at $20,000.

The end of October saw the close of a series of experiments with a captive balloon, conducted by the Italian Government. The balloon was inflated from the deck of the "Elba." The aeronauts were able to see the movements of the "enemy" in the mimic attack and photographs of the cruiser "Francisco Fenuccio" and the city and peninsula of Augusta were taken.

Renault Freres have put on the market an aeronautic motor.

"The Car," of November 13, in giving the contestants in the 1907 Gordon Bennett leaves America with but two balloons, Mr. Hawley being omitted altogether.

The "Korea-Asia Daily" quotes Colonel Cody, who is said to have had a great deal to do with the building of the English "Nulli Secundus," as saying, "While the French, German and English armies are progressing in military airship building, America is lax. Airships are now placed on the Franco German frontier. One spectacle of the next war will be battles in the air. The advantages of the airship are that from it an enemy can be observed, explosives can be dropped and besieged towns relieved. Airships are not dangerous, because gas is kept in separate compartments, and one or two bullets would not be effective against them. When I have completed my British contract I shall return to America and urge upon the Government the advantage of having an airship to watch, for instance, the hostile natives in the Philippines."

During November, at the Mississippi State Fair at Jackson, the "California Arrow" made nine very successful and pretty ascents; six with Captain Baldwin aboard, two with Mr. Augustus Post, Secretary of the Aero Club of America and one with Mr. A. P. Shirley, of Nashville. On one trip Captain Baldwin sailed from the grounds to the State House, about a mile, landed and called on Governor Vardaman and after circling the Governor and the State House returned to the aerodrome. Five other exhibition flights were made, lasting from 20 to 30 minutes each. Mr. Post's two half-hour trips were exceedingly well conducted. The weather was perfect and though Mr. Post had never before sailed an airship his operation of it was correct in every respect. During the one trip the airship was headed into the wind and "hovered" over a foot-ball game that was in progress. Mr. Shirley also made his first airship flight and though his flight was not quite as long as the others he piloted the ship as ably as an expert.

Mr. Wilbur Wright has returned to America.

"The present aeronautical activity recalls the kite craze of fifty-five years ago, when kite carriages were being extensively built and experimented with. With the aid of two kites a carriage was pulled twenty-five miles an hour."—*Chicago Journal.*

From an account given in the Neue Freie Presse of the recent experiments of Mr. Wels at Trautenau with an aeroplane which he has invented, it would seem that on Oct. 8 he was successful with four flights, beginning with 164 yards and ending with 262 yards. The apparatus, which has no motor at present and is simply a

gliding plane, has a supporting area of about 430 square feet. The flight is launched from the sloping side of a hill near the works.

Alfred Le Blanc, who was second in distance traveled in the St. Louis international balloon races, and first in the length of time in the air, received from the Aero Club of France a gold medal. He says of his American experience: "The organization at St. Louis was wonderful and the quality of gas excellent, while the pressure was such that all the balloons could have been inflated in two hours and a half, which, of course, could not be done in Paris." St. Louis is glad to know that its first attempt is so well appreciated by experts. It expects to accomplish bigger things in its aeronautic programme of next October.

The latest recruit of the corps of aeronautic experimenters in Paris is M. Kluytmans, a Dutch engineer, who has invented a new type of steerable balloon. This is a cylindrical aerostat divided into two equal parts, between which a screw revolves, thus giving the motive power in the axis of the airship instead of from below, as in the case of the Patria.

Almost a full sized model of the machine, brought by M. Kluytmans to Paris, has won commendation from eminent aeronauts.

It is reported that the Engineering Department of the Russian Ministry of War has appointed a special Commission to take charge of the construction of a dirigible. The envelope is to be made in Russia.

Announcement made that the well-known Siemens-Halske-Schuckert Electric Co. has decided to make a business of building military ships and selling them. The company has begun the construction of an airship designed to outstrip in speed and power all those so far built. It has also been experimenting with gasless machines.

The English Government started work on a successor to the Dirigible No. 1 which met with an accident after a trip to London, recorded last month. The new ship is to have an added weight carrying capacity of about 1400 pounds over that of the former and it is expected that the new 100 horsepower engine will drive it at a speed of 40 miles an hour in calm air. The following table shows a comparison of the new airship and the Nulli Secundus as altered since its voyage over London:

	Nulli Secundus.	New Airship.
Engines (horse-power)	50	100
Gas-bag capacity (cubic feet)	54,000	64,000
Gas-bag diameter (feet)	30	42
Lifting power, including equipment and passengers (pounds)	3,400	4,800
Speed per hour, in calm (miles)	17	40
Maximum number of passengers	3	6

Announcement is made that M. Charron, M. de Contade and M. Mallet have formed a company for the purpose of building dirigibles. It is said that three were ordered by private people and one for the use of visitors to Paris who wish to make trips. The cost of passage on a trip is estimated to be from 500 to 1000 francs ($100-200) for each passenger.

The following "ad" recently appeared in three Chicago newspapers:

"WANTED—Brave chambermaid, cook, deck hands and night watchman to sail on an airship; good wages; none but persons with steady nerves need apply."

In returning to America on November 21, Wellman said: "I am not dis-

couraged. I expect to make another effort either next year or the year after and if I can only find favorable weather I can reach the pole. My*****test of the 'America' was a success."

"At the unveiling of Rodin's bust of Henley in Westminster Abbey," said a New York editor, "a number of good stories were told about the poet. H. G. Wells praised Henley's conduct of the *New Review*. Of course, this periodical failed, yet it was undoubtedly the best-edited magazine of the last century. In it Henley introduced to the world new writers of such distinction as Joseph Conrad, Kenneth Grahame, W. B. Yeats, Mr. Wells himself, and so on. One day as Mr. Wells and Henley stood in the office of the magazine, discussing rather sadly its gloomy prospects, a funeral went by with slow pace. Henley leaned out of the window and looked at the funeral anxiously. Then he turned to his companion and said with a worried frown: 'Can that be our subscriber?' "—*Washington Star.*

This does not refer to the American Magazine of Aeronautics.

In the Kreisblatt, a newspaper published at Hoechst, near Wiesbaden, Germany, there recently appeared the following advertisement: "Can anyone favor me with the names of the balloonists who, when passing over the village of Ried last Thursday evening, dropped a bag of ballast down my chimney and completely ruined a fruit tart which I was above?—Julia Schmidt, 14 Britzelgrasse, Ried."

If the correspondents of the local newspapers studied up a little on the subject of aeronautics they would not be so ready to print the "hot-air" so plentifully fed to them and we would also be spared the fantastic statements and stories that have been already in months.

St. Louis and Aerial Navigation. The St. Louis Aero Club has decided to make balloon racing an annual event in that city. Plans are perfectly, it is said, "for a week of aeronautics" in St. Louis in October, 1908, and so generous will be the prizes that balloonists from all parts of the world are expected to participate in the contests.

Chicago is not as yet a balloon center, and does not pretend to be, although it has more wind to spare for ballooning purposes than any other city in the country; therefore, it hesitates somewhat to offer St. Louis any advice on aeronautics.

The time is almost certain to come when we shall take the lead in ballooning as in everything else, but before that time comes balloons will have to be so constructed that they will revel, so to speak, in our prairie zephyrs and lake-breezes, and be able to navigate them with ease and suffer no sort of trouble while being carried in three or more different directions by our fresh air currents.

But we are not giving local ballooning much thought as yet. We are too busy now striving to navigate the surface of the earth. As soon as our traction systems are thoroughly reorganized and our traction lines completely rehabilitated, so that we shall not have to give so much attention to balancing ourselves from straps, we may take up aeronautics and give our hearts to the sport. If we ever do, St. Louis may as well learn now as any time, we shall put into ballooning the same energy, the same enterprise, the same spirit that we put into everything else when we settle down to serious work.

However, perhaps for the very reasons we have stated, we are in a better position to give St. Louis advice than if we were a balloon center ourselves, or were thinking of becoming one in the near future.

We can at least be disinterested. We can at least advise St. Louis as an outsider. And we should be privileged, under the circumstances, to offer our counsel to our sister city for what it is worth.

Our idea, then, is that St. Louis is going about this annual balloon race in the

wrong way. We noticed the other day that just as soon as a balloon was sent up in St. Louis it proceeded to get as far away as possible from that city. Every balloon that was sent up took a course of its own, the aim of each and all of them being, apparently, to get away regardless entirely of the direction in which it traveled. St. Louis could see the balloons for only a few minutes, because they traveled with greater speed when leaving that city than they did at any other time.

Now, there is nothing novel in the fact that balloons hurry away from St. Louis when they see nothing ahead to prevent them from escaping. So it occurs to us that what St. Louis should do is to plan an aeronautic contest which would be practically the reverse of the one now in mind. That is, the balloons should start from different points throughout the country with the St. Louis as their destination. St. Louis could then safely offer even more generous prizes than she proposes to offer now to the balloons that would land there.

It may require a quarter or a half century of annual contests before a single balloon lands in St. Louis, but when one does land there then St. Louis may well claim that she has solved the aerial navigation problem, and can well afford to pay over the prize, provided it shall not be discovered that the balloon in question landed there entirely by accident.—*Chicago Inter-Ocean.*

One on the Sexton.

Alexander Graham Bell, whose experiments promise to give him as wonderful a success with the flying machine as he had with the telephone, at a dinner in Washington told this story:

"Many years ago an aged friend of mine visited a church in Maine one Sunday morning. As soon as the sermon began, my friend, who was very deaf, took from his pocket an ear trumpet in two parts and proceeded to screw the parts together.

"While he was engaged in this work he noticed that the sexton, from his seat near the pulpit, kept frowning and shaking his head at him.

"Finally, just as my friend got his trumpet joined and made as if to put it to his ear, the sexton hastened to him and whispered fiercely:

" 'Ye can't play that here. If ye do I'll put ye out.' "—*Los Angeles Outlook.*

Mr. Israel Ludlow is inaugurating an aeronautic lecture tour, beginning after the close of the Jamestown Exposition. The talks will be illustrated by moving pictures of the 1906 and 1907 Gordon Bennett, the Santos Dumont aeroplane, the Ludlow kite, and various others relating to the art.

Colonel Gadke, retired, of the German army, has published his views on the dirigible in war. He comments on the great success attained thus far in the building of dirigibles but points out that, so far as he is aware, the greatest wind that has been faced by La Patrie was about fourteen meters a second, and that the ascents made have been under favorable circumstances, such as would not be met in time of war. He goes on to say that the dirigible can only be considered from the standpoint of use as a means of reconnoissance and transmitting orders or communicating between a besieged fortress and the interior of the country, the armies in the field and the Government. Colonel Gadke also considers the meeting in the air of hostile airships and their attempts to destroy each other.

In view of the opinion of some that an elimination race for the purpose of selecting a team is unfair and impracticable, it may be of interest to know that the Niederrheinischer Verein für Luftschiffahrt, on August 15th, held a contest whose object was to find out which balloon should be one of the three to represent Germany in the Gordon Bennett race for 1907. The three balloons which took part were as follows: "Elberfeld," pilot Milarch; companions, Spindler and Vogt— "Abercron," pilot, Niemyer; companions, Althoff and Diepenbrock—"Düsseldorf," pilot, von

Abercron; companions, Weiss and Stach. The Düsseldorf made 384 miles, the Elberfeld 300 miles and the Abercron 312 miles. The Wiener Luftschiffer Zeitung remarks "it would appear that the Düsseldorf was superior to the other balloons."

A new aeroplane is nearing completion at Sartrouville under the direction of Kapferer and Paulhan, who assisted in building the Ville de Paris. This machine is said to approximate the Langley type.

M. La Las is reported to have made a kilometre against stream and a kilometre with the stream in 1 min. 56¼ secs., allowing for time taken in turning. This is a mean speed of 38.5 miles per hour. The time, however, was not taken officially.

In spite of the good work Farman is doing abroad, it is the general opinion in America among those who ought to know that he has about reached the limit of possibility with his present machine. The main difficulty seems to be transverse stability, though we have not yet heard of him making his turns and evolutions in a strong wind.

Mr Edgar S. Smith, a student at a college in California, has been experimenting with a gliding machine for some time. On November 2, through the carelessness of the boys who were assisting in the launching, the aeroplane suddenly dipped and struck the ground from a height of 60 feet. The machine was a wreck but the operator escaped uninjured. Work was started on a new one at once.

When aerial navigation gets into the racing class generally, how would you like to be an airship jockey?

Society balloonists who endanger the public by dropping ballast on the heads of pedestrians have been dubbed in England "air hogs." The English language keeps on growing all the time.

Mr. Charles K. Hamilton will fly one of Mr. A. Roy Knabenshue's airships next summer.

The "California Arrow" has made nine successful flights during 1907 with Captain T. S. Baldwin as pilot.

On November 27 Mr. G. H. Curtiss, of Hammondsport, N. Y., made the first flight in a new twin-screw dirigible, the invention of Captain Thomas S. Baldwin.

On November 13 Dr. Alexander Graham Bell finished his latest kite "The Signet."

"The famous flying machine built by the Brothers Wright is still attracting attention, and I now learn from a sure source that the negotiations with the German Government have been brought to a satisfactory close. The latter have agreed to pay a large sum for the American inventors' secret, and all now depends upon a series of trials to be made in Germany, and in which the Wright machine must accomplish the performances claimed for it. When speaking with the Wright Brothers' representative, I naturally asked why they did not come forward and compete for the £2,000 prize offered by Deutsch-Archdeacon for a kilometre circuit. 'We are running for higher stakes' was the answer immediately given me."—*The Car.*

U. S. ARMY AERONAUTICS.

The balloon house which was constructed some years ago at the Signal Corps post of Fort Myer, Va., and recently occupied by the Quartermaster's Department, has now been again turned over to the Signal Corps. It will be used for overhauling all Signal Corps balloon material, and conducting experiments, until such time as the new buildings are ready at Fort Omaha, Nebraska.

Some time during the month of December, 1907, the Signal Corps will probably issue a specification and advertisements inviting proposals from manufacturers in the United States to build a small 2-man dirigible balloon for the Signal Corps. These advertisements will be sent to any persons in the United States who are prepared to build dirigible balloons, if they will apply to the Signal Office, War Department, for a copy of the specification, and stating their experience and facilities for manufacturing dirigibles.

CURTISS MOTOR VEHICLE CO.

Announcement is made of the completion of the organization of the Curtiss Motor Vehicle Company, of Hammondsport, N. Y. The company is a consolidation of two or three concerns. It will manufacture the Curtiss engine and motorcycle, dirigible balloons, flying machines and also a low priced automobile.

The officers are: Mr. W. G. Critchlow, President; Mr. G. H. Curtiss, Vice-President and General Manager; Mr. L. D. Masson, Secretary Treasurer.

Dr. Alexander Graham Bell's Aerial Experiment Association will make Hammondsport the Winter headquarters.

NEW AERONAUTIC HANDBOOK.

THE PROBLEM OF FLIGHT, by Herbert Chatley, B. Sc., is the latest work on aeronautics and should appeal to the practical man. The contents of the book are as follows: Causes of Progress in Aeronautics—Classes of Air-vessels—Dirigible Balloons—Gasless Machines—Balancing—Nine Essential Principles—Chanute's Criteria—Nature of a Helix—Thrust, Velocity, Weight and Power—Values of "w"—Helix Shafts—The Level Governor—Thrust and Resistance—Position of Axis of Thrust—Vertical Helix—Types of Propellers—Construction of Helix—Resistance of Air—Wind Pressure and Inclination of Plane—Researches into Subject of Wind Pressure—Balancing of Aeroplane Systems—Stresses in Stays—Starting Aeroplanes—Angle of Elevation—Aera—Insect Flight—Bird Flight—Researches of Pettigrew and Marey Vertical Fans—Artificial Bird—Equation of Motion—Ascensional Force—Resistance to Balloon—Electrical Machinery—Researches of Renard and Krebs—Form of Minimum Resistance—Sine Curve—Author's Heliconef—Rudder—Motor and Fittings—Balancing—Stability—Oscillation. The book is fully illustrated and has much useful data. Published by J. B. Lippincott Co.; obtainable through this magazine. Price $3.50.

AERONAUTIC CALENDAR.

Dec. 8.—Aeroplane race at Issy les Moulineaux.

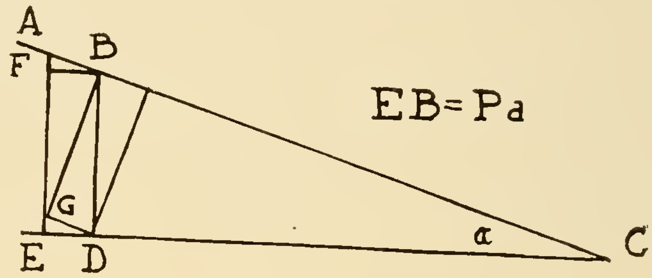
1911.—International assembly of dirigibles in Italy, under the auspices of the Societa Aeronautica Italiana.

COMMUNICATIONS.

Editor of the American Magazine of Aeronautics,
New York City.

Dear Sir:

In Professor Langley's "Aerodynamics," on page 60, he says the weight of his experimental aeroplane, when it is exactly balanced by the upward component of the air pressure, is equaled by Pa cos a; Pa being the normal pressure. I suppose that he worked it out somewhat as follows:



Let ABC be the surface of the aeroplane, and EDC a horizontal line; then the angle BCD will be the angle a. Then let EB represent the normal pressure, Pa. By the resolution of forces the upward component (equals W) will be EF or DB. Now, since the angle EBD is also equal to the angle a, then DB=EB cos a, or W=Pa cos a.

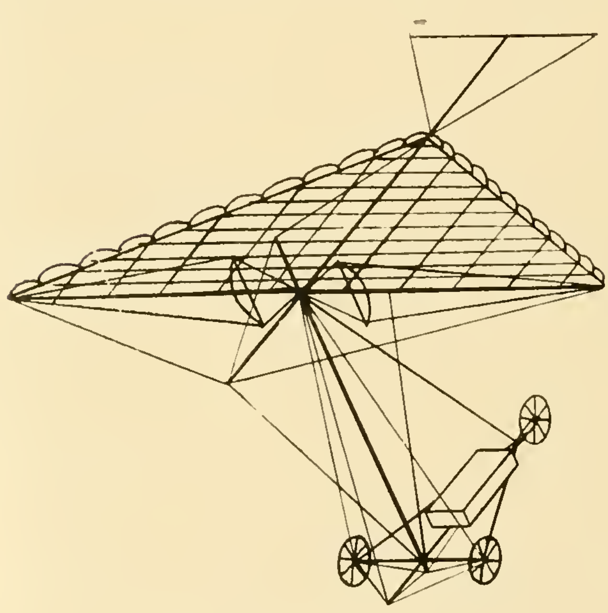
This is all very clear; but, if BD=W, its normal component by the resolution of forces will equal BG, and not BE; and the weight of the apparatus, in resisting the normal pressure of the air, would only be represented by BG. This being the case, it would appear by the resolution of forces that, while the vertical component of the normal air pressure balances the weight, the normal component of the weight does not balance the air pressure. Otherwise stated: W=BD=EB cos a=Pa cos a (by Langley); but, reversing the formula, Pa2=BG=BD cos a=W cos a. Pa2 is intended to represent Pa as found by the second method. If Pa2=W cos a, then W=Pa2 $\frac{1}{\cos a}$. Therefore, Pa2 $\frac{1}{\cos a}$= Pa cos a; but Pa2 should equal Pa, in which case $\frac{1}{\cos a}$=cos a. Of course, this is impossible, except when a=0: but what is the matter with the formulas; which is right; and what is the correct balance?

Will you kindly explain this matter, and greatly oblige,

Yours very truly, R. W. S.

A NEW FLAPPING WING MACHINE.

Mr. Stanislaus von Wiszcewsky has applied for patent on a new flapping wing machine. The wings measure 25 feet from tip to tip and 8 feet from front to rear. The total length of the machine from front to rear, including rudder, is 16 feet. There are 10 "flaps" to each wing which are intended to offer little resistance to the air on the up stroke but to furnish lifting power on the down stroke. In speaking of his machine, the inventor stated:



THE WISZCEWSKY MACHINE.

"Studying natural flight all my life, I never found any reason to doubt that flight was anything but a mechanical art; merely a question of levity and power. The wings are levers of the second (?) order. The tips of the wings of nearly all flying creatures move in a vertical direction, up and down at the beginning of the flight, about 30 feet in each second. The resisting air (the fulcrum) yields to

the wing's center of pressure, which is near the tip, in half a second (on the down stroke of the wing) 12 feet, or 24 feet in one second of effective lifting. Thus, in order to lift the body (relatively to the ground) 1 foot, it must actually be lifted 25 feet in each second. According to this law, an eagle weighing 10 pounds would have to develop nearly one-half a horsepower at the beginning of its flight. A natural flying machine weighing 600 pounds needs close to 30 horsepower to start it into the air. Considering the loss by friction, etc., I think a 40 horsepower motor is necessary. This explains why all attempts of men to fly with wings have failed for lack of a sufficient light motor of great power. Many models having india rubber for power were successful because rubber can, for a short time, develop more power per pound than any motor so far invented. I have never heard of a full sized machine which had wings light and strong enough for the purpose. Bamboo sticks can never serve as levers for a 40 horsepower motor. The wings of my machine are not only light and strong enough but are on the down stroke, in its concaveness and obliquity, a true counterpart of the bird's wings, and more effective than the natural wings, because the reaction on the up stroke is reduced to a minimum."

AERONAUTICAL SOCIETIES OF THE WORLD.

Reprinted by Request.

International.

The International Commission for Scientific Aeronautics.

The Permanent International Aeronautical Committee, Pres., Prof. Hergesell, Meteorological Institute, Strassburg, i.E., Germany.

Federation Aeronautique Internationale, 84 Faubourg St. Honoré, Paris, France. The clubs marked with an asterisk (*) are members of this federation.

National.

France.

*Aero Club de France, 84 Faubourg St. Honore, Paris, France.

Aeronautique Club de France, 58 Rue J. J. Rousseau, Paris, France.

Academie Aeronautique de France, 14 Rue des Goncourts, Paris, France.

Societe Francais de Navigation Aerienne, 19 Rue Blanche, Paris, France.

Societé des Aeronauties du Siege, Paris, France.

Aero Club du Sud-Est, Bordeaux, France.

Aero Club du Rhone, 4 Quai Pecherie, Lyon, France.

Aero Club du Nord, 4 Rue de la Gare, Roubaix, France.

Club Aeronautique de l'Aube, 23 Place de la Bonneterie, Troye, France.

Automobile Club de Nice, Section Aeronautique, 7 Promenade des Anglais, Nice, France.

Aviation Club de France, 3 Rue Taitbout, Paris, France.

Germany and Austria.

*Deutscher Luftschiffer-Verband, c/o Hauptmann Hildebrandt, Kirchstr. 2, Charlottenburg, Germany.

Berliner Verein für Luftschiffahrt, Dresdenerstrasse 38, Berlin, S. 14, Germany.

Münchener Verein für Luftschiffahrt, Kaufingerstrasse 26, Munich, Germany.

Oberrheinischer Verein für Luftschiffahrt, Münsterplatz 9, Strassburg, i. E., Germany.

Augsburger Verein für Luftschiffahrt, 83 Carolinenstrasse, Augsburg, Germany.

Niederrheinischer Verein für Luftschiffahrt, 35 Königstrasse, Barmen, Germany.

Posener Verein für Luftschiffahrt, 10 Gartenstrasse, Posen, Germany.

Ostdeutscher Verein für Luftschiffahrt, Ostbank für Händel und Gewerbe, 9 Pohlmannstrasse, Graudenz, Germany.
Frankischer Verein für Luftschiffahrt, 11 Bergermeisterstrasse, Würzburg, Germany.
Mittelrheinischer Verein für Luftschiffahrt, Casinostrasse 37, Coblenz, Germany.
Kölner Verein fur Luftschiffahrt, Kallenburg 1-3, Köln, Germany.
Physikalischer Verein in Frankfort a.M., Stiftstrasse 32, Frankfort, Germany.
Motorluftschiff-Studiengesellschaft m.b.H., Spandauerweg, Berlin, Germany.
Wiener Flugtechnischer Verein, Eschengasse 9, Vienna I, Austria.
Wiener Aero Club, Annahof 3, Vienna I., Austria.

BELGIUM.

*Aero Club de Belgique, 5 Place Royale, Brussels, Belgium.
Aero Club des Flandres, Flanders, Belgium.

ENGLAND.

*Aero Club of the United Kingdom, 166 Picadilly, London, W., England.
Aeronautical Society of Great Britain, 53 Victoria St., London, S. W., England.

ITALY.

*Societa Aeronautica Italiana, Via delle Muratte 70, Rome, Italy.

SPAIN.

*Real Aero Club de Espana, Alcala 70, Madrid, Spain.

SWITZERLAND.

*Aero Club Suisse, Hirschengraben 3, Berne, Switzerland.

SWEDEN.

*Svenska Aeronautiska Sallskapet, Stockholm, Sweden.

RUSSIA.

Russian Aeronautical Society, Panteleimonskojaz, St. Petersburg.

AMERICA.

*Aero Club of America, 12 East 42nd St., New York.
Aero Club of Philadelphia, Philadelphia, Pa.
Ben Franklin Aeronautical Society of the United States, Schuyler Building, 6th and Diamond Sts., Philadelphia, Pa.
Aero Club of St. Louis, 704 Locust St., St. Louis, Mo.
Aero Club of Chicago, 79 Randolph St., Chicago, Ill.
Aeronautique Club of Chicago, Chicago, Ill.
Aero Club of New England, Hotel Touraine, Boston, Mass.
Pittsfield Aero Club, Pittsfield, Mass.

Errata.

In publishing the list of societies in the November number through an error the Ben Franklin association was omitted, and it was stated that the Italian Society was under the patronage of the King of Spain. This should have read "King of Italy." We also neglected to state that the Swedish club is also a member of the F. A. I.

RARE AERONAUTIC BOOKS FOR SALE

This magazine will publish each month a list of such rare books relating to aeronautics as it is able to secure.

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Travels in the Air (James Glaisher). 8vo., cloth, London, 1871. .... 10.00

Crotchets in the Air (John Poole). 12 mo., cloth, London, 1838 .... 5.00

Flying and No Failure. Very rare reprint. Pamphlet. London, 1751.................. 3.00

By Land and Sky (John M. Bacon). Four illustrations. 8vo, cloth, uncut, London, 1901 2.50

A Balloon Ascension at Midnight (G. E. Hall). Plates by Gordon Ross. 8vo, boards, uncut. San Francisco, 1902. Limited edition 2.50

Five Weeks in a Balloon (Wm. Lackland). 12 mo., cloth, N. Y., 1869..................... 2.50

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My Airships (Santos-Dumont). Illustrated. Crown 8vo, cloth, uncut, London, 1904......... 1 40

The Dominion of the Air. The story of aerial navigation. Illustrations from photographs. Crown, 8vo, cloth, London, n. d. 2.00

My Life and Balloon Experiences. Photograph of author. Crown, 8vo, cloth. London, 1887 .... 2.00

Travels in Space (G. S. Valentine and F. L. Tomlinson). Introduction by Sir Hiram Maxim, 61 plates. 8vo, cloth, London, 1902. .... 2.00

Balloon Travels (Robert Merry). 12 mo., cloth, N. Y., 1865 ....$ 2.50

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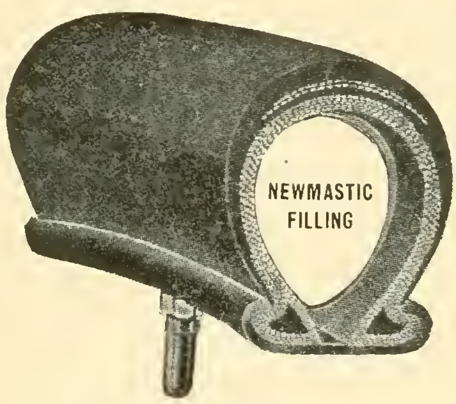

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A MINUTE DESCRIPTIVE ACCOUNT OF

"A MOST SURPRISING ENGINE,"

Invented, constructed, and used with the greatest success, by Jacob, the son of Mr. John Daniel, of Royston, the latter of whom, who survived his son, died in 1711, aged 97.

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FROM THAT EXCESSIVELY-RARE LITTLE WORK,

"Narrative of the Life and astonishing Adventures of John Daniel, a smith, at Royston, in Hertfordshire, by the Rev. Ralph Morris,"—London, 1751.

"It was not long after this, that Jacob desired me to go with him to the mountain, to see him fly his Eagle, as he called it; and I, with great expectations embraced his proposal; telling my wife, what I was going about, and planting her properly to be a spectator of it.

"We loaded the cart, and conducted it up the hill; when discharging it of its burden, we turned the cow to graze, and began our operation. He first of all struck four poles into the earth at proper distances, measuring them with four bars, in the ends of the two longest of which, on the flat sides, were four holes, into which the four points of the upright poles were to enter, at about three feet high from the ground; then letting the ends of the shorter pieces, (of which there were several) all tennanted at the ends, into mortices or grooves on the inward edges of the two long pieces; he pinned them in very tight, leaving about a foot space unfilled up near one end, where he had contrived a trap door to lift up and shut down at pleasure; so that when the whole wood-work was framed, it looked like a stage or floor, upon which he could mount, by getting under it, and opening the flap door. In the middle of this floor was a hole about four inches diameter, to let in a pipe like a pump, to the upper part of which was an handle on each side, and a pendant iron between them, which ran through the pipe beneath the floor; and the pipe itself was held firm in the floor, by four long irons fastened to its body, and screwed down to the floor in a square figure: This was the whole form of the upper surface of the floor.

"Near the extremities of this floor every way, at proper distances, on the under edge, were driven in several flat and broad-headed staples, into each of which were thrust and screwed in a thin iron rib, about three inches broad next the floor, and from thence tapering to a point, at the length of about three yards, so wrought and tempered, as to be exceeding tough and elastick, with each a female screw at about three foot distance from the edge of the floor; these were all cloathed with callicoe dipt in wax, each running into a sort of scabbard or sheath, made proper in the cloth to receive it, and being all screwed to their staples and the floor, made an horizontal superficies of callicoe, (including the floor) of about eight yards diameter, but was somewhat longer than broad.

"On the under side of the floor was a circle of round iron, above five feet diameter, with several upright legs, about a foot long, equal in number to the above described ribs, and standing in the middle space between them; each of

which legs entering upwards through a recipient hole in the floor, was screwed tight by a nut on the upper side of the floor. Between these legs, on the interspaces of the round iron ring, just under each rib, hung ballances, exactly poised upon the ring, with all their ends nearly meeting in the center, under the pipe hole, each of which, by an iron chain fixed to it, was linked to the sucker iron of the pipe or pump, and the other end was, with a like chain, linked to an iron loop, screwed into the female screw of the rib, just placed over it; and then all the cloathing was hooked upon little pegs all round the outward edge of the floor, so close as to keep the air from passing in any quantity.

"Thus the whole apparatus being fixed, my son opened his trap door, and ascending through it, mounted his floor, fixed the handle, and began to play his wings, to see that all was right; (but very gently, for fear of rising off his poles, till he was quite prepared.) I then observed, that when the pump handle was pressed downwards, as in pumping, that raising the sucker, the pendant iron raised the end of the ballances next to it, when the other extremities of the ballances, hooked to the several ribs, necessarily descending, drew their corresponding ribs downward; and that the uplifting of the handle consequently gave the ribs liberty, (through their springiness) to return to their horizontal position again; so that they were raised and depress, proportionably to the motion, and force of the handle, and exactly answered the use, and play of wings in birds.

"Having found that every part answered to his wish, and having fastened his trap door down, the whole machine standing at such a height that I could both look under, and over it, it appeared to be of a vast dimension.

"It was of almost an oval form, and each wing extended at least three yards at the sides from the floor, but at the two ends it was somewhat more: and there being a handle on each side the pipe or pump, he could make it go which way he would, by altering his own standing, as he told me, either on the one side or the other of the pump; for the side he stood on being the heaviest, and the other consequently mounting rather the highest; it would always move that way, which end was the highest.

"I told him, I looked upon it as an ingenious sort of whim to try an experiment with, and that as I had seen it play, I was now satisfied it would fly, but advised him to come down for fear of any accident.

"Jacob growing impatient of delay; come, father, now I am mounted on my Eagle, says he, you shall see me fly. I would fain have dissuaded him; but he began with his pump handle, and rising gently from the posts, away he went, almost two miles; then working his contrary handle, as he told me, he returned again, and passed by me to the other end of the mountain; then soaring a little as he came near me again; Father, says he, I can keep her up, if you can guide her to the posts. I did so, and he seemed so rejoiced at his flight, and so alert upon it, that perceiving with what ease it was managed, and how readily it went and returned, and he entreating me to take a turn with him, I at last consented. Jacob having brought me to his wish, opened his trap door in great joy and let me up; then making all fast; father, says he, lie you, or sit close to the pump on that side, whilst I work it on this; and seeing me somewhat fearful, don't be afraid, says he, hold by the pump irons, you are as safe here as on the solid earth; then plying his handle, we rose, and away we went." —(!!!)

FARMAN WINS $10,000 DEUTSCH PRIZE IN KILOMETRE FLIGHT JANUARY 13th!

See Article by Winner this Issue.

American Magazine — OF — Aeronautics

CONTENTS FOR JANUARY

VOL. 2. JANUARY, 1908. No. 1.

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The True Principle of Measuring Speed

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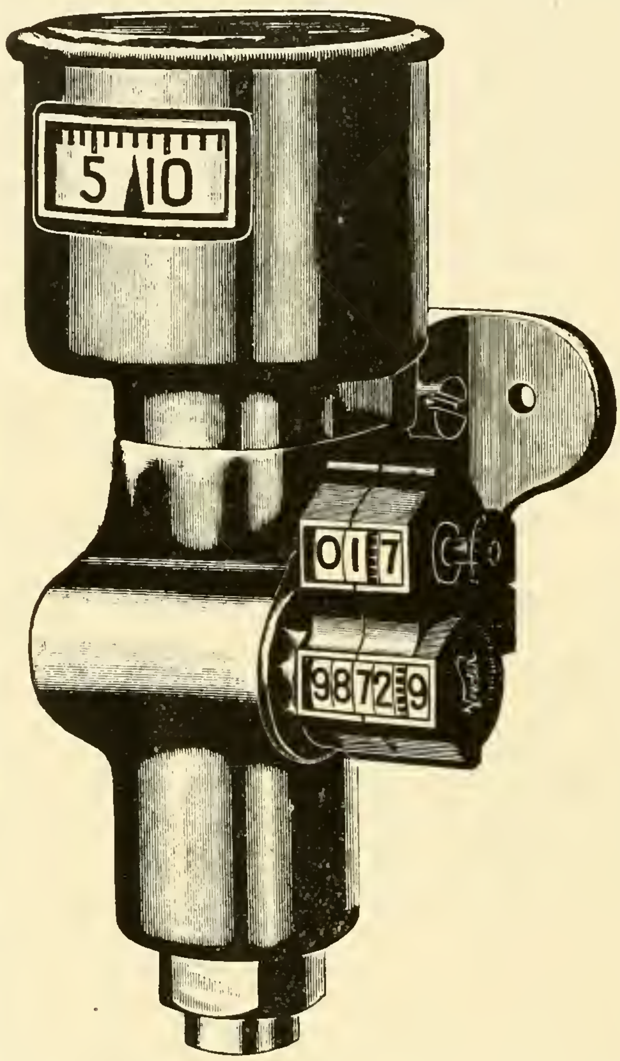

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VOL. II JANUARY, 1908 NO. 1

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ERRATA.

We wish to correct one or two misstatements which crept in the last number. Under the heading "The Need for a Club Park" we stated that there were two manufacturers of balloons in the A. C. A. There are three: Messrs. Baldwin, Stevens and Myers. Among the "Notes" we stated that Captain Baldwin "made nine successful ascents during 1907." For "1907" read "November." 92 ascents were made during the year.

THE GOVERNMENT DIRIGIBLE AND DYNAMIC FLYER.

Referring to the specifications issued for a dirigible balloon and a dynamic flying machine for the use of the Signal Corps, one finds considerable difference in the requirements of the two vehicles. Placed in comparison, the reasonableness of the requirements for the one make the unreasonableness of the requirements for the other the more apparent. We must consider these specifications in the light of the present time, and in that light the above statement is made. Were these specifications issued some time in the future, perhaps years later, we might reverse the charge of unreasonableness, for then the requirements now demanded of the dirigible balloon would be far below the standard at that time, while now the demands for a dynamic machine are of such a nature that the likelihood of the absence of practical bidders is great.

In the case of the dirigible balloon, the only objection we might make is the fact that the bidder is not allowed to furnish the cloth. No doubt the bidder could secure the same grade of silk at as low a price as the Government will secure it, and might make a profit on it. No builder will undertake the construction of such an uncertainty as a dirigible balloon—one larger than has ever been seen in this country—unless there is a chance for profit, of course. And constructors would be more likely to bid were they allowed to furnish the dirigible complete from start to finish,

in which case, of course, the Government could easily protect itself by passing on the silk before it goes into the making. In all other respects the demands seem to be moderate and well able to be carried out in the United States.

In regard to the dynamic machine, much might be said. In the first place, the Government seems to take it for granted that the whole matter is very simple and is only a question of drawing up a set of plans within a month and starting to work. We do not think the state of the art has progressed quite as far as this. We very much doubt if there is anyone in America who could build a machine of any type and fly five miles with it on first trial—we except the Brothers Wright in these considerations for we doubt if they will care to bid—and to demand a continuous flight of one hour without a stop, why, that is more than we ever heard of the Wrights, or anyone else, doing, in Europe or this country. The Government is not buying a perfected piece of mechanism like an automobile. There is not a known flying machine in the world which could fulfill these specifications at the present moment.

Paragraph "1" is perfectly proper.

Paragraph "2" demands more than we think will be accomplished for many years—a folding pocket edition of a flying machine! One might ask that it be non-sinkable as well.

Paragraph "4" calls for at least 36 miles an hour. The Wright Brothers made a little more than 38 miles average an hour in their flight of 24 1-5 miles.

Paragraph "5" states that the time will be measured over a course of five miles with and against the wind.

Paragraph "13" is certainly incongruous, as no living being can anticipate what kind of brains will be furnished by the Government to be instilled with the proper instruction to manage the proposed flying machine, and even if two men of reasonable cranial development were presented by the Army as its best specimens of aeronauts, how is it possible to figure on how much it would cost to successfully infuse into their domes of knowledge a satisfactory working understanding of the new flying machine. Perhaps the introduction of the victims to the bidders would have a bearing on the amount of the bid, as to the expense of the instruction.

There may be several inventors of dynamic apparatus in whose promises great confidence might be placed. We assume that the promises being equal, the contract would go to the lowest bidder; and if he failed, a contract would be let to the second lowest bidder, and so on. If each failed to fulfill requirements it might be several years before the plans of each had been given a trial and the Government would then be no nearer having a machine than now. Much valuable time would be lost, with only experience gained by the inventors.

Had an inventor such a machine as required would he not be in a position to ask almost any reasonable sum from the Government for its use. Would not the Government instead of the inventor be a bidder?

We quote from the New York Globe:

"One might be inclined to assume from the following announcement, 'the United States Army is asking bids for a military airship,' that the era of practical human flight had arrived, or at least that the government had seriously taken up the problem of developing this means of travel. A very brief examination of the conditions imposed and the reward offered for successful bidders suffices, however, to prove this assumption a delusion.

"A machine such as is described in the Signal Corps' specifications would record the solution of all the difficulties in the way of the heavier-than-air airship, and, in fact, finally give mankind almost as complete control of the air as it now has of the land and the water. It would be worth to the world almost any number of millions of dollars, would certainly revolutionize warfare and possibly the transportation of passengers; would open to easy access regions hitherto inaccessible except to the most daring pioneers, and would, in short, be probably the most epoch-making invention in the history of civilization.

"Nothing in any way approaching such a machine has ever been constructed (the Wright brothers' claims still await public confirmation), and the man who has achieved such a success would have, or at least should have, no need of competing in a contest where the successful bidder might be given his trial because his offer was a few hundred or thousand dollars lower than that of some one else. If there is any possibility that such an airship is within measurable distance of perfection any government could well afford to provide its inventor with unlimited resources and promise him a prize, in case of success, running into the millions."

We doubt very much if the Government receives any bids at all possible to be accepted.

As an alternative to this plan, the Government might offer a cash sum as a prize to the inventor who produces a machine coming up to what may reasonably be expected during the year, with the privilege of purchasing at or about the cost of construction, a duplicate. The machine would not be perfect but the inventor would be recompensed for his time and labor and be given encouragement to expend further effort; and the Government would have a machine with which the Signal Corps could practice, providing in the meantime a recruiting station to fill in the ranks decimated by the infernal flyer. Each year, if the prize were won, the conditions could be made more difficult. The Government would thus spread over several years the amount now probably to be demanded by the constructor and greater opportunity for improvement be given. Every year, perhaps, the Government would obtain for a reasonable sum a machine of more or less value with which to experiment themselves and with which to train their aviators.

The only two conclusions to be reached from this invitation of the Government are either: that the powers inviting bids are totally ignorant of the difficulties involved in the problem of gasless flying machines and are groping in the dark to get information, or at any rate see what comes of a request by Uncle Sam to his inventors, which have in the past served him in such good stead by producing in time of need the seemingly impossible; or else, fully realizing the present state of the art, which gives no indication that the requirements can be fulfilled, the purpose is merely to spur on inventors to make progress and reach the desired goal at their own expense without assistance from the Government, which actually appears to impose a penalty for the effort since a deposit must be lodged with the bid and bonds furnished for the faithful carrying out of the specifications. The possibility of an over-confident inventor having his bid accepted, and then through unforeseen circumstances fail to fulfill expectations and become caught in the meshes of legal difficulties added to official red tape, is horrible to contemplate, and is more likely to crush a promising inventor than develop his genius.

Perhaps the Signal Corps has been too much influenced by the "hot air" of theorizers, in which aeronautics unfortunately abounds, who have fathomed the entire problem without ever accomplishing anything; talk is their stock in trade and models or machines are beneath them because beyond their impractical nature.

Why is not the experience with Professor Langley a good guide? Some $100,-000 was expended and while his machine was never given a fair trial, a fac-simile of his machine, the Bleriot, recently flew in Paris and Professor Langley's labors brought this country to the front rank many years ahead of all other nations, and now after 14 years his efforts and results are still the highest and most reliable reference in the art.

THE AIR FIGHT OVER TRIESTE.

William Bevier Ashley.

ILLUSTRATED BY ROE FULKERSON.

I witnessed that first battle in the air, that aero engagement in the Turkish embroglio about which so much has been inaccurately written, and believe the first and foremost aeronautic magazine in the United States to be the proper medium for giving the facts to the public. Further, a close personal acquaintance with Lieutenant Benson enables me to add some interesting information as to what preceded the fight.

The Franco-Russo-Italia forces had effected a remarkably clever strategem; they had pinned the allied English and Japanese armies and their fleet inside Corfu and its harbor. The one defect was, that while the fleet could not leave the harbor to attack the blockaders lest the land forces, held in check by the fleet's big guns trained on the hills, should annihilate the numerically inferior allies; yet, neither could the enemy's ships enter the harbor and give battle, because they would certainly have suffered swift destruction. The blockaders once disposed of, the fleet's guns would have been landed and planted where they could sweep the three-fold armies off the landscape—but if that feat had been attempted before destroying the blockading fleet, the latter would have closed in at once, sunk the disarmed vessels, and reduced Corfu to a graveyard.

Understanding this situation, it will be clear that the whole absurd conflict depended now upon getting re-inforcements by sea; whichever side could first bring up more ships would hold the trump card. The Franco-Russo-Italia combination had no doubts on that score! They had already summoned the Italian fleet from Ostia, having first cut off all communication between Corfu and the world outside,—they thought; but they reckoned without Benson, naturally. At noon of the fourteenth, then, the Italian ships of war would arrive outside Corfu; by that same hour the delayed artillery would be in place commanding the town; and in twenty-four hours after all that the war would be over! Such at any rate, was the confident expectation which Benson discovered and reported to the Conclave of English, American and Japanese Commanders in the besieged city. It certainly was not a cheerful one for them to contemplate.

Our fleet of five first-class battle ships and a half dozen small craft, with four transports carrying more passengers than the law allowed, and the squadron of sixteen aeros, had been lying at Trieste for five days waiting for the word that would unite us for action with the two other parties to the "Sandwich Alliance," as it was called. Outside communication had ceased suddenly two days before, so we knew something was doing somewhere, but where? And for two days we had been on the quee vee, as Buller put it, cursing our idleness.

Only the United States had detailed an air squadron, for messenger service, and Lieutenant Benson with the Bald Eagle, the pet of the squadron, was attached to the Conclave. So he had been caught in Corfu like a bird in a pit, for you can't get up in the air when gunners lie in a circle watching for you. It was Benson's confounded impatience that led him to volunteer the spy act, and it was his inevitable good luck that got him safely back with his tremendous news. It made the Conclave sit up stiff. There was just one thing to do,—get the word to us, five hundred miles away, by ten o'clock the next morning; later than that there would be no chance to beat the Italians to Corfu; and there was just one way to get that word to us.

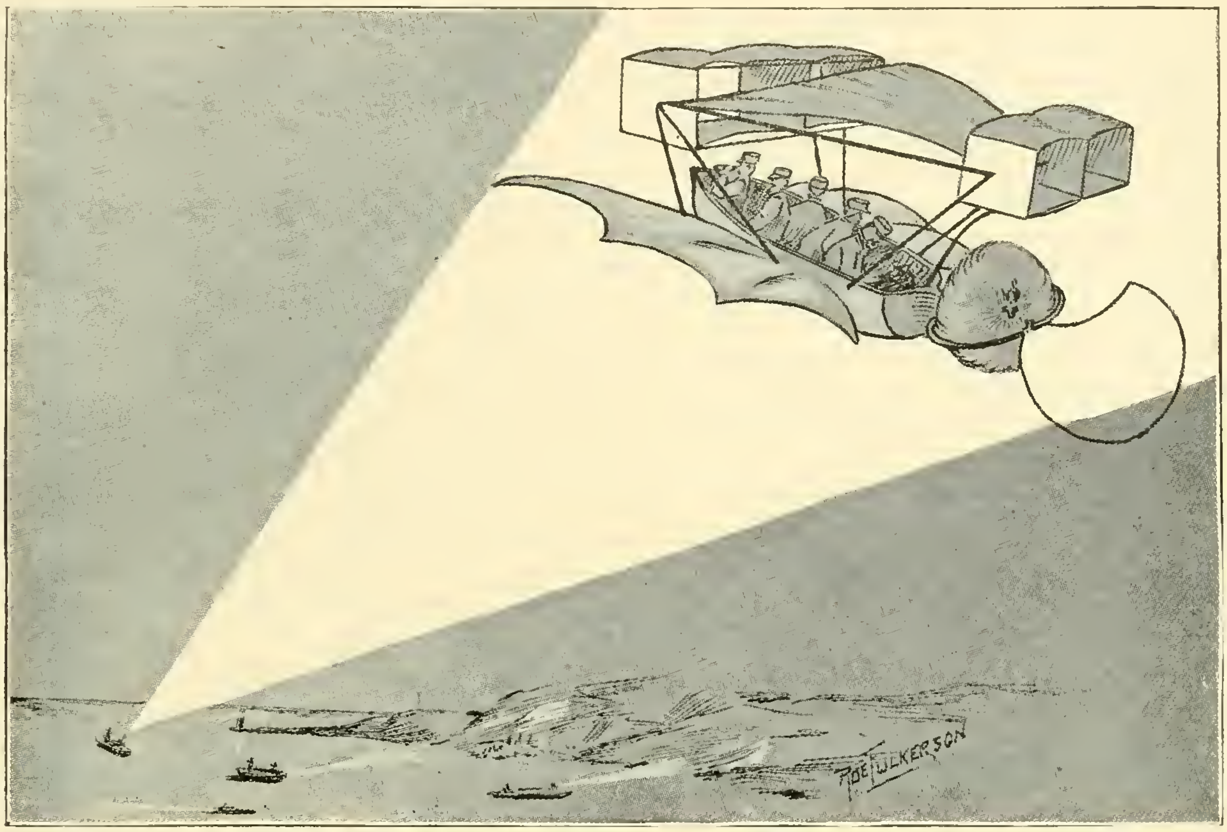
All this developed about nine P. M., September twelfth. The Bald Eagle cut away as soon as the night got thick, hanging low and stealing south hoping to escape the search lights constantly playing between the enemy's fleet and camp; and then to make a sharp turn and head straight for Trieste on the biggest effort

of her life. Those courier aeros had been hurried together with little regard for perfection of detail, but the working parts were all there; and though they were not intended for fighting purposes the squadron had had some drill for united work in an emergency. They carried crews of five, and were manipulated with remarkable ease.

When the Bald Eagle had gotten beyond the zone of the search light, Benson veered her sharp to the north, and started to light his pipe.

"It's all over now, Schwartz," he told his engineer, with a gay laugh; "let her rip!" Then, he says, he thought his match must have exploded the atmosphere. They were in a blaze of light, and realized in a second that some ship lying further up the coast than they had supposed, had picked them out.

"Up!" shouted Benson, and the great bird slanted with a jerk that all but pitched every man off, and climbed into the sky like a rocket. But that search



'A ship up the coast had picked them out.'

light hung on, while another began to wigwag against the hill, and in no time there was a splendid display of candle work back and forth.

Benson shrewdly reasoned that his direction when discovered would make his purpose clear, and he knew there was but one way under heaven to frustrate him and that was to catch him. Setting his course by the compass and the north star, he kept the Bald Eagle moving, and tried to pierce the darkness behind them. Going at a fifty mile clip, he soon escaped the search light, but the waving streaks could be seen for a long time, merging at last in one slowly fading glow. Their light had revealed nothing to Benson.

For seven hours they tore through the night, not a man willing to sleep a wink. Then, in the first flushes of dawn, the tired fellows saw, about twenty miles to the south, a fleck of cloud that seemed to come along their track as though caught to them by an invisible wire. When he saw that, Benson says his first impulse was to push the Bald Eagle ahead with his arms; then he felt fierce rage shake him, and wanted to turn back and fight; next he determined to order three

men overboard so as to lighten the aero! These wild impulses passed through him like so many electric shocks, but left him cool and confident.

"Crowd her past the last notch," he ordered, "and get your guns ready for business, boys!" Then he settled down to studying that cloud through his glass.

The entire Russian aero squadron was following him, evidently with the intention of shutting off every chance of escape in any direction. The Russian hawks were making faster time than was the Eagle, and when Benson was assured of that disquieting fact he prepared his message to us and placed it in a rubber bag attached to a cork buoy. Then he took his bearings and decided he would reach Trieste in exactly three hours, "splendidly convoyed by twenty Russian aeros of the line;" whistled "Good Bye, Little Girl, Good Bye," to cheer up his men, and gave himself over to the exhilaration of the chase.

It was the sixth day we had kicked our heels in sight of Trieste, and we were feeling frazzled. Just outside the city, on a small hill, our sixteen aeros lay in a circle about the tents of the crews. The men were rattling things and poking about as usual, making everything trim for any sudden call. I took a mild interest in watching them, for we lay well in towards shore, and I wondered what ailed Captain Studley when he suddenly jumped on a crate and leveled his glass off toward the south. My own keen sight could detect nothing of interest in the sky, and I waited to see the captain give it up. But he seemed to have discovered something, for he grew more and more tense, and his glass did not move a hair breadth. Then I dimly heard him shout to his men, who came running about him and stood as if waiting for his next word. Things were getting interesting. Our men began to stop at the sides of their vessels to watch the proceedings. I heard the Admiral direct an orderly to bring up his glass, saw Studley take an involuntary step forward on the crate, and then we were thrilled by the bugle call: "Make ready to ascend!"

"Make ready to ascend!" The Admiral dropped his glass, for it had told him enough, and ordered to quarters. Inaction and indifference were gone in an instant, and every man as he made his way to his station looked like a school boy let out for a holiday. And all the while the aero crews were on the jump, Studley still scanning the distance. Then, presently, we too saw the flyers—a locust leading a swarm—and guessed that our turn had come at last.

But why didn't the Bald Eagle signal? What was the row, anyway? Should the squadron mount and learn up there the solution? The unmistakable advantage of Benson's pursuers drove us wild for action.

Suddenly the squadron's signal man wig-wagged "Yes." A short pause, then "Yes" again, and across the stillness between us came clearly the sharp bugle call "Let go!" and they were off. We had not seen Benson's signals for "help" and "haste," but we guessed them, and sent a yell after the ascending eagles.

Already hundreds on land were running back and forth in the wildest excitement seeking vantage grounds from which to witness this unheralded spectacle, for the oncoming aeros could now be seen without effort, the brave eagle nearly surrounded by the eager hawks, the only clear space being beneath her and in front. *We* realized that up there five men were counting their lives worthless for the glory of the Flag; the first heroes in the new department of war.

The aeros were at an altitude of about two thousand feet; and within five miles of the harbor the Bald Eagle headed downward. The Russians fired at her—and hit; but they dared not follow, for our own brood was now at their level, waiting for them, and there was nothing to do but slow down and make the fight.

But on came the Bald Eagle like a crazy thing. That dastardly shot had done its work, and she refused to obey the rudder. Four hundred yards from the flagship she plunged into the waters to her planes, and stopped, floating on the waves like a gigantic octopus. And it actually seemed as though the ship's yawl was alongside before the crew struggled up through the frame work; and before we

could get our breath the fleet was under way. Knowing at last the meaning of the Bald Eagle's desperate race, our interest now centered in what the Russians would do to escape our aeros and get a warning back to Corfu of their failure in the chase.

Both squadrons had swiftly taken position about five hundred yards apart, each covering an enormous area, and giving the appearance from below of great erratic clouds. Studley had arranged his force to attack, the formation consisting of two quarter moons, one higher and in advance of the other and containing six aeros, the lower ten describing a more extended curve. His intention was to separate the Russians, and drive them seaward and down.

The Russians evidently guessed the purpose, and had formed in three similar curves at equal distances apart; one under the other, you understand. Thus the attack would be met squarely, so to speak, resulting in a general mix-up which would give the Russians the advantage in close range firing. So without blare of trumpets or sounding of drums, the first battle lines in mid-air were formed.

"The crews braced themselves for the supreme moment."

What for long had been the experimental pastime of the coolest and most daring sportsmen, in an instant had become the machinery for the ultimate effort between opposing nations.

Studley's shrill whistle sounded, and the sixteen beautiful aeros advanced; steadily and swiftly they closed on those waiting rows, the crews braced themselves for the supreme moment, the Russians signaled and cloud melted into cloud as the squadron swept in together at close quarters.

Then a hurricane struck that cloud! From below the appearance was as though no human element existed in that wild confusion. Two eagles clinched beak and claw with three hawks, and dropped in horrible mixture and ruin. Tangled in the huge falling bulk, the men struggled at each other over and through the mass of twisted rigging, shouting in rage and hatred, knowing death was inevitable and their share in the fight ended.

Then, like the scattering of a cloud by opposing winds, the squadrons drew apart. Fierce volleys had torn through flesh of man and bird, and eagles and

hawks alike pitched along, their decimated crews striving frantically to bring them about. But the ships themselves seemed to answer the signal whistles, and almost between eyeblinks the separated units had gathered in place for the next effort. And it came without delay. We knew by the arrangement of the eagles this time that Studley wasn't going to try out fancy maneuvers, and by the same token we prayed mercy for the Russians, for here was coming a trick prepared as a finishing stroke by long and patient practice.

Obviously the planes are the needful things in these remarkable craft, but they overreach the bodies so far it is as disastrous to an attacking aero to try to rip through its opponent's rigging, as it could possibly be to the foe, for, chances to nothing, the two will never get apart again. The Russians were hanging out over the water in extended order, just exactly what Studley needed, and without giving them any chance to close in, he sounded the momentous signal.

There was a vision of giant birds swooping upon their prey—a catching of breath in the watchers below—and six of the bewildered hawks were each flanked by two eagles who, as they drove alongside, careened heavily, exposing the hawks' planes to an oblique, riddling fire, and swept onward righting as they went.

The unattacked Russians remained motionless, staring over at their utterly demoralized aeros as, collapsing, they floundered downward like the wounded birds they were, casting upon their crews, pitched headlong, the shadow of a horrible death. From watching in stunned silence this fearful catastrophy which had not cost the eagles a feather, the Russians lifted hungry eyes toward Studley, now swinging his reunited fleet into line for the expected onslaught.

For a moment more the hawks tarried. The eager signal to avenge did not sound. Instead, there appeared to be a huddling together as in conference, then an extending of their line as if in some new formation to meet the changed conditions, and then—away, away like the wind in wild flight.

But our yells of triumph died against our teeth as the truth flashed home. What were lumbering battle ships against aeros? That was no flight, and we were outdone. But Studley was awake. Our pets were not canaries. Like a flash they were under way; first a long range volley that scattered a few feathers, winged a bird or two, sent a few groaning men whirling through the air; and then to the chase, faster, faster, till our eyes blurred with the straining, and clearing again, saw no sign of the racing combatants.

As we eased our aching necks and thought again of ourselves, we found we were traveling rapidly out to sea, with a twenty-hour run ahead. The aeros could make the distance, flying straight, in ten; whereas the Italians, if they had left Ostia promptly, still required nearly six hours more than we to reach the scene of activities. What desperate measures the allied enemy would resort to if advised of the situation by one of the escaped hawks, we could not surmise; but we realized that everything might yet be lost if Studley did not overhaul and destroy the Russian aeros.

Overhauling and destroying to-morrow would have seemed easier. Yet, way off to the right and low down, suddenly appeared the two squadrons coming our way. Surely, Studley had never rounded up that covey?

Sometimes you can see a ragged cloud scurrying across the face of the sky as if in flight from a solid band of gray beyond. Such a sight greeted our astonished eyes, for so were the out-maneuvered hawks flying before the steady line of eagles close behind. Six remaining aeros were scattered far apart in utter abandonment of each other, straining ahead in futile effort to twist around the ends of that long curved blade of death, and escape. But the grim eagles swept relentlessly along, holding well within range the dodging prey.

The spectacle, in spite of its meaning, was magnificent. These aeros appear from below to move without effort; and with what speed! Immense, graceful things, like some enormous birds of a fantastic imagination they now soared toward

us, as though to be wondered at and admired. They grew larger and took more definite shape, and their speed became more apparent, but still there was the same noiseless, effortless, steady cleaving of the air. Did I say 'despite the meaning'? Perhaps because of the deeper meaning the spectable was superb. For this was the long desired mastery of the air!

One hawk soon made a despairing plunge, then another, and then all as though in panic, and then Studley followed. The death signal was given and a final volley ended the chase.

The rest you have known all along, for the press was full of it: how we arrived off Corfu to the bewilderment of the enemy, eight hours ahead of the Italians, and ended that nasty little war in short order. But much has been said that could never have been written by one who had witnessed this engagement over Trieste.

It is true that the entire Russian air squadron was destroyed; not a man escaped death. And five of our own eagles and their brave crews rock in their last sleep in the cradle of the Adriatic. The press has made much of this, and many people believe this engagement proves the unfitness of any kind of air ship for war, claiming that a battle between them means inevitable destruction and awful deaths—and without glory. I will not argue this here more than to point out that only four of our sixteen aeros were lost, and the special messenger Bald Eagle, whose men were saved. And to say that but for the air squadron's part in the conflict, the bloodiest battle of history would have been fought—and over what? The skill, the courage, the glory of this thing cannot be made to shine in type! As to the manner of death involved, before we finally forced our way into Corfu harbor, over the funnels of eleven war ships going down with their imprisoned crews, I saw two headless trunks lying under foot on deck of the flag ship.

THE WRIGHT BROTHERS FLYING MACHINE.

By Captain Hildebrandt.

So many insinuations of doubt as regards the actual flights of the Brothers Wright have been expressed by people here, and abroad particularly, that the following statement of an investigation made the latter part of October of this year by a prominent officer of the German Army should go far towards settling the question as to whether the Wrights actually flew.

As to the details of the machine, however, it is unreasonable to expect that anything very definite could be gleaned from the verbal descriptions, made spontaneously without consideration, of local people who saw, from a distance, the machine fly two years ago. Pictures of the Wright glider and drawings based upon the plans filed in the Patent Office at Washington, which can be procured by anyone interested, have appeared without number: but it is preposterous to assume that any drawings can be made from the enthusiastic information so freely offered by lay persons who cannot distinguish between an "airship" and a dynamic apparatus.—*Editor.*

[Dayton, Ohio, end of October.]

"Confused by hatred and favor, its portrait swings on the balance of history." This can also be said of the Wright Brothers flyer! Every expert knows that the two have built a flying machine; and it is generally believed that they have made flights with it in the open. But that they have covered long distances at great speed, again returning to the place of ascent, is to this day being contested by most aeronauts. In order to throw a little more light on this subject I have made exhaustive investigations right here on the spot with ten witnesses, by reason of which I have come to the conclusion that all the statements relative to this flying machine are absolutely true.

Wilbur and Orville Wright are scholars of the ingenious aeronaut Otto Lilien-

thal, who was mortally wounded during his experimental flights on August 9, 1896, near Berlin. O. Chanute was their American master, who enjoys the best reputation in the professional world and who, like the aeronaut Herring, made numerous gliding flights according to Lilienthal's example. Gliding flights mean flights with a flying apparatus from an elevated point gradually downwards, like an inclined plane. After the brothers had practiced such flights sufficiently, along the shores of the Atlantic, with an even strong wind, and had acquired great skill, they started to build a motor in the year 1903. This was completed according to their own instructions in their bicycle factory. They were now in a position to fly through the air in all directions under their own power; could not alone glide against the wind on an inclined plane, as theretofore, but could also fly upwards.

The data made public on March 12, 1906, by the inventors on the results obtained with the motor airship created great sensation. According thereto, the best flight of 38,956 meters (24 1-5 miles.—Ed.) should have been accomplished on October 5, 1905, in 38 minutes and 3 seconds. If these statements are real facts, the age of balloonless dirigible airships was thus broken.(?) First of all, the experts maintained an expectant attitude, and then a challenging one. Their actions were thoroughly warranted. First, it was said that the American Government had bought the machine for One Million Dollars; then, suddenly, this statement was denied and it was rumored that the Wright Brothers were endeavoring to dispose of their invention in France. However, the negotiations proved unsuccessful because the constructors demanded that their machine be purchased before inspection for One Million Dollars; but, of course, they agreed to exhibit the flyer in a 50-kilometer-long flight after the contract had taken effect. No one, however, would agree to such arrangements. Then nothing more was heard from the Wrights until the Aero Club of America declared that, by reason of their investigations, they had come to the conclusion that the statements of the Wright Brothers were true. Being interested in the matter I decided to personally make investigations right on the spot and to throw light on the matter. First of all, I put myself in touch with the two competitors of the Wrights, Herring in New York and Chanute in Chicago. The former explained to me that he cannot doubt the statements made in view of his investigations with witnesses. The matter is so simple that he hopes by far to beat the performances by aid of a light motor tested by him, weighing only 1 pound per horsepower. Chanute, on the other hand, has personally seen a flight of three-quarters of a mile and frankly admitted that the Wrights had excellently solved the flying machine problem. The machine is said to be extremely simple and the flight had taken place in an astonishingly safe manner. Chanute had come to the conclusion that the Wright Brothers are on the right path and, therefore, he abandoned his experiments of years with a heavy heart because he could not compete with them any more. At my wish he gave me a list of some of the witnesses of the flight.

Then, together with Carl Dienstbach, who has lived in New York the past fifteen years, I went to Dayton and here visited the father of the brothers, the old American Bishop, Milton Wright. The old man of about seventy years of age verified in simple language that he had witnessed the longest flight. He happened there by chance. Troubled constantly in regard to the fate of his sons who had subjected themselves to such daring flight experiments, he had frequently gone to the trial grounds and thus had been witness of numerous ascensions. He would not go into full particulars in the matter. If I had any doubts whatever after my conversation with the two competitors of the Wrights, they would have been dispelled after my visit to the father. I believe that there can be few suspicious people who would doubt the words of this old, honorable priest. But personal feeling should not have any bearing in this important matter. It was, therefore, necessary to look up absolutely neutral people.

We interviewed Mr. C. S. Billman thereafter, secretary of a bank. He ex-

claimed excitedly: "Well, she flies!" Then he pictured how imposing it looked when the flying machine rose from the ground and flew over the fields about the height of a tree in a slightly undulated manner; how readily she answered her rudder and returned to earth. "Like a duck she squatted on the ground." He, likewise, would not go into particulars regarding the construction of the apparatus. He concluded with the words: "The brothers deserve the best pecuniary success, as they are well educated men who have grown up under hard work."

Far more communicative was a young druggist, Reuben Schindler, who had witnessed the long flight without being invited. On one day when he had expected a flight would be made, he had followed father Wright at a distance and had thus witnessed an excellent flight. A laborer happened to come into the drug store, who had also been an uninvited onlooker to a flight, who confirmed in an exhaustive manner the statements made by Mr. Schindler.

From here we turned our steps to an old tinsmith, Henry Webbert, who had frequently seen the airship in his son's workshop. This humble workman treated us with great reserve; but, nevertheless, gave us most interesting information regarding the flight itself and the landing. The airship descended so gently, "like a turkey descending from a tree." In regard to the speed, however, the old man exaggerated to some extent; 50 miles covered within an hour!

A good many details on the construction of the flyer were given to us by a German hardware dealer, Frank Hamburger, who had been a keen observer and endeavored to make his statements more clear to us by aid of some sketches. The druggist, William Foots, also showed a good understanding for technical matters and gave us a few valuable points; whereas, the engineer Laurence Wright, though confirming the fact that the flights had been made, refused to give any description as to the appearance of the machine.

Finally, we succeeded in talking with two more very important people, C. V. Ellis, officer of the law, and Torence Hoffman, president of the largest bank in the city. The interview with these prominent people was of especial importance to us because they gave us reasons why no more ado was made about the great results of the Wright Brothers. After the first successful flights the brothers had invited a great number of citizens to witness a flight. Upon taking the airship out of the shed it was injured and the trials, therefore, were abandoned. The disappointed public from that time on viewed the matter with great suspicion and the Wrights did not invite anyone since then and have kept further practical trials secret. The president of the bank, furthermore, stated that he could not see the practical value of the machine. The fact that the apparatus made its ascent from a rail appeared to him to be a great handicap.

I have formed the following conception of the construction of the aeroplane, based on what I have heard in regard thereto: the flyer proper is a so-called "double-deck" type, consisting of two broad rectangular surfaces arranged one on top of the other. In the front we find a horizontal plane for regulating the height. In the back a vertical plane for steering right and left. The motor is installed in the middle and actuates two large propellers. The planes and motor are mounted on runners on which the flyer glides when landing. Before starting the flights the machine does not rest on these runners, but on a platform which is mounted on two wheels, arranged one in front of the other. As soon as the propellers are set in motion the platform with the flyer runs along a track about 250 feet in length until the flyer has attained a certain speed. The machine rises in the air, leaving the platform behind. The trials took place on a rectangular meadow surrounded by trees and sheds having a circumference of about 1 mile. This field was circled about 30 times in the longest flight. The flights were made in calm weather as well as during a strong wind.

I believe that no one can seriously dispute the existence of the first practically tested flying machine any more. It is impossible that so many distinguished people

of the most varied occupation and ages could have agreed to "lie faster than a horse can trot" for the sake of an inventor. Under such long cross-questioning, which was made in accordance with a previously arranged program, they would have contradicted themselves easily. It is furthermore to be understood that by reason of lack of time I looked up only ten people, nearly every one of which named further witnesses. But why do the Wright Brothers refuse to exhibit their flyer in flight to eventual buyers before closing an agreement? If they really obtain such good results they would not have to shun daylight! I believe, that I have also found a plausible answer to this question. The flyer is, in fact, so simple that they fear the purchaser will not pay such a large sum as One Million Dollars. Furthermore, I am inclined to think that it requires great skill to handle the machine. Not every aeronaut would be in a position to fly away with it at once; on the contrary, great skill is required, which the Wright Brothers acquired by reason of their numerous gliding flights.

I am now of the opinion that after it has been proved that one can also fly with airships not carried by balloons we must seriously turn to the construction of flying apparatus. On the other hand, I am of the firm belief that a sum as high as Four Million Marks will not be required if we entrust German engineers and aeronauts, for example, Regierungsrat Hoffman, of Berlin, with the solution of this problem. Surely we will not have to be behind the American inventors.

Translated from "Lokal Anzeiger," Berlin.

INTERNATIONAL AERONAUTICAL CONGRESS.

President: Professor Willis L. Moore.

Secretary: Dr. Albert Francis Zahm. Chairman Gen'l Committee: Wm. J. Hammer.
Chairman Executive Com.: Augustus Post. Sec'y Committees: Ernest La Rue Jones.

Publication Notice.

The addresses, papers and discussions presented to the Congress will be published serially in this magazine and at the earliest date possible bound volumes will be distributed without charge to those holding membership cards in the Congress. Others may purchase the volume at a consistent price when ready or may take advantage of immediate publication by subscribing to this magazine at the regular rate.

In accordance with the program as published in the November number, the informal addresses of the Gordon Bennett contestants and others are concluded before entering upon the printing of the formal papers and discussions.

The remarks of General James Allen, Chief Signal Officer of the Army and Major George O. Squier, of the Signal Corps at Fort Leavenworth, Kansas, conclude the addresses.

The formal papers and discussions begin in this issue with: "Our Army and Aerial Warfare," by Lieut.-Col. William A. Glassford, Chief Signal Officer of the Department of Missouri, U. S. Army; "Some Model Aeroplane Experiences and Details of Man-Carrying 'Aeroplane,'" by A. V. Roe, member Aero Club of the United Kingdom; Discussion of Mr. Roe's paper, by Octave Chanute.

Aeronautics in the U. S. Signal Corps, by Gen. James Allen.

When it was learned that General James Allen, Chief Signal Officer, could attend the meetings, he was requested to say a word for the U. S. Signal Corps. He responded extempore as follows:

We are building at Omaha a large aerodrome and it is there we hope to do all the work we do in the Middle West. It is a large building 200 feet long, 100 feet wide and 80 feet high. Our reason for placing it and doing the work there is be-

cause we have a large host there, about 300 Signal Corps men whom we propose to train in this business. We intend starting with some of the smaller machines which we will send out to Omaha and there train our men. We will later, no doubt, also have one erected on the Atlantic Coast and one on the Pacific.

We are more interested in the dirigible balloon than the aeroplane.

We are going to make the hydrogen gas by the electric process. The first we tried was the liquid air process, freezing the ordinary gas. It was promising but not successful. It looks as though it could be done and at almost no cost. It seems that the by-product ought to pay for the gas. Then we tried the gas hydrolith. We have a ton or two on hand with which we can experiment, when we can all get together in some convenient place, I hope, and inflate a balloon so that everybody can see it. That is as far as we have gone now. We are training our men. Several of you gentlemen have been very kind to the Army. You have been teaching our men for free flights. The army is in thorough accord with you.

We will have to place an experimental plant at wherever is the best place on the Eastern coast. We want it somewhere near New York and as soon as we can find a good place we will build a gas plant and everybody can bring their machines down there and try them. That is about the status so far as we have it in the Army today.

The Advantages of Aerial Craft in Military Warfare, by Major Geo. O. Squier.

At the conclusion of Gen. Allen's remarks, Major Squier was called on by the Chairman and replied as follows:

I happen to have been serving during the past two years at Fort Leavenworth, which is the headquarters of three of the service schools of the army. The military authorities at these institutions have shown by the official action of their academic boards their deep interest and belief in the future of military aeronautics. It is believed that aerial navigation as a practical result is coming rapidly. Its radical influence on the methods of warfare will compare with the invention of gunpowder or the tactics of Frederick the Great. Now that we can rise above the terrain and gain information of armies and consequently plan accurate movements, nothing could be more valuable.

The practical dirigible balloon is here now. The work of the past 200 years or so is now coming into fruition rapidly. Each month gives us more confidence. The general principles of war are really very simple, and work themselves out in typical forms in combat.

Military tactics are at present very much the same in all armies. Each nation knows about as much as any other. The question then comes of introducing some new principle and bringing it to such perfection as to be able to gain decisive victories before an opponent has opportunities to profit thereby. Napoleon grasped such an opportunity at a critical time in military history, and for several generations thereafter the armies of the world followed the great Corsican. The last great war was conducted strictly in line with the text books; accompanied at times with unlimited slaughter. The great object of war is to bring about a decisive result with a minimum destruction of human life. If we could utilize scientific principles to bring about this result without killing anyone, this would be the result to be obtained. We have but three military arms; the infantry, the artillery and the cavalry. The cavalry is designed to scout and develop information for use in the handling and operation of the army with which it serves.

Aerial navigation furnishes us an additional weapon for obtaining information and for furnishing the means for using the information thus obtained. It will enable the maneuvreing of the armies by stragetic marches and surprises to bring about decisive results with a minimum destruction of life. It will enable us to leave a terrain to which to have been tied for a thousand years and into the air

and move about rapidly. Trained observers can leave a frontier, scout about an enemy's country and return in a single night with information of vital importance. It is surprising how difficult it is to obtain information of the whereabouts of an enemy's force. On of the great lessons of the Manchurian war was the value of secrecy as displayed particularly by the Japanese. With an army involving say, 300,000 men, anything like "team play" requires perfect lines of information and control, to bring about that concerted action which alone can produce decisive results at present. Without such information the combat reduces itself to a number of small detail facts. The principle of the great fight is "team play," and aerial navigation will help to bring this about. When Oyama has a battle line of 40 miles in length and has to operate 300,000 men distributed along that line, you can see how helpless he would be to carry out any concerted action without perfect lines of information and control. If he could use dirigible balloons which are valuable today and could obtain accurate information as to the location of the enemy's forces and issue his orders and have them delivered promptly, you can readily see what that would do, when opposed by an enemy without such service.

The Hague Conference took this matter up. Airships are already regarded by the leaders of military thought as a military weapon. Whether or not it will be permitted to drop high explosives on defenseless people I cannot tell. I can see how it is even possible now to tow a lot of high explosives with a dirigible airship and drop the tow, with its destructive load, approximately at such point as is desired. It would be evident to you, then, that the success of aerial navigation means much to the military student in introducing a new and radical principle in warfare, and offering extended possibilities for bringing about decisive results by strategic movements into untenable positions rather than by loss of human life. The subject with which this Congress is engaged is of the greatest importance and is of interest not only to the military and naval service but to every citizen of this country.

Our Army and Aerial Warfare, by Lieut.-Col. W. A. Glassford.

The captive military balloon used by the United States Army in connection with military operations has a record of several conspicuous accomplishments. Artillery fire was, for the first time in history, directed against a concealed enemy from a United States military balloon. The first use of the military telegraph from a balloon is an achievement of Signal Officers of the United States Army. The lurking place of the Spanish fleet was first confirmed by observations from a balloon of the United States Army. The reopening of artillery fire from El Pozo Hill, suggested by balloon observations during the siege of Santiago de Cuba, also the discovery of the "trail" from the balloon, contributed to our success at San Juan Hill.

These recent instances of the utility of captive military balloons would ordinarily be enough to establish them in favor. Remarkably enough, instead of these instances stimulating the interest of the country, interest has continually waned, just as it did in France from the eighteenth century until after the Prussian invasion in 1870. Now that France and other countries have developed the balloon to a demonstrated utility it is incumbent upon our army not to remain unprepared to defend itself with or against this new weapon. The balloon as a useful adjunct to operations in war has yet but a scant appreciation from the present officers of our army. This fact arises from their not having had opportunities for experience with the new weapon.

Observations from balloons were made for the Army of the Potomac during the Civil War by civilian aeronauts. Commanders then little realized the practicability of a safe station high in the air with an enormous radius of observation from which to observe an enemy whose location and movements were otherwise concealed. The possibility of artillery fire control from the basket of a balloon where the enemy

below could be seen was scantily understood. The pay of the civilian aeronauts appears to have been reduced for the purpose of driving them from the service. These civilians were not replaced from any branch of the military establishment. This is not so surprising as at first it might seem. No important military work conducted by civilians with an army has ever succeeded.

It is a noteworthy fact that the most conspicuous mention of our balloons during the Civil War was made by observers from foreign armies. It is astonishing that we have to look to these foreign military writers for a just tribute of praise to the important part played by the balloon in the early battles in Virginia.

In the middle 80's the success of the French in navigating a dirigible balloon called the attention of the world to military aeronautics. In the early 90's investigations into the mechanics of flight earnestly conducted by so learned and serious minded a man as Prof. Langley again drew attention to aerial navigation through the development of his dynamic flying machine.

In October, 1890, Congress extended the scope of work under the Signal Corps of the Army to the duty of collecting and transmitting information. This added function of Signal Corps work naturally included aerial navigation because it was an important means of collecting information, the transmission of which only needed the application of devices already in common signal use. From this time on is found frequent official reference by the War Department to the desirability of developing means of aerial navigation. These references beat upon deaf legislative ears; politicians could not see what science was bringing on.

About this time the writer was sent to Europe to investigate aeronautics there, and a large balloon for our army was constructed in France, using the same material as is used in the English Army. This balloon was sent for exhibition to Chicago, from Chicago for use at Fort Riley, Kansas, and later for practice ascensions to Fort Logan, near Denver, Colorado. Here a large balloon shed was erected, a hydrogen generating and compressing plant installed, and hydrogen gas storage tubes provided. At this place other balloons were made and a small military detachment was made familiar with their working. Maneuvers with balloons were made in the presence of Infantry and Cavalry and thus a small part of the Army became conversant with the object and utility of the captive military balloon.

At the commencement of the Spanish War the balloon plant that had been assembled in Colorado was shipped to Fort Hamilton, New York. The object of sending a balloon to a post at the approaches to New York City was for observation so as to give early notice of the approach of a possible Spanish Fleet. This equipment was later sent to Cuba. Unfortunately, it was only after five days' urging that the Commanding General released his prohibition to its landing and even then permitted only the reserve part of the equipment to be taken ashore. This using of the reserve gas came from a natural lack of knowledge on the part of General Shafter and of those about him. It limited the operation of the balloon to a single inflation. Nor was this all, it was due only to the insistence of an Engineer Officer that it was used even then and at the battles before Santiago. It was due also to this official, unfamiliar with the place of a balloon in battle, that it was taken to within the zone of the enemy's musketry fire. However, General Shafter, after the Spanish Fleet had been located in the Santiago harbor, artillery fire had been advantageously directed and roads or trails discovered from the balloon, acknowledged its satisfactory performances.

Since the battle of San Juan the army has scarcely seen a balloon and information about balloons is confined to newspaper mention. The officers who would now command our armies in case of war, not having seen airships in operation, must rely upon their intuitive resourcefulness to guide them in their use. This ignorance, amounting as it does almost to negligence, should be corrected, and the use of balloons demonstrated at the great training schools and maneuvers, where officers could verify what is said to be possible of them and permit them and their work to be seen by the army, as is done abroad.

The elements of military aeronautics should be taught at all service schools and throughout the army, also practical demonstrations of balloons should be sedulously conducted at maneuvers where the army, the National Guard and the people can be brought to see the real use of this new weapon.

The long range modern field gun, with its smokeless powder, finds its usefulness diminished unless the object aimed at is located with certainty. The increasing difficulty of field artillery fire control and directions can be overcome through the military airship. Officers of the field artillery are rapidly recognizing that some means to locate the concealed target, in the use of their modern long range guns, is an essential. The balloon or flying machine is the most apparent means. The General Staff of our Army is not likely long to permit this military essential to go unprovided.

Aeronautics is not fully appreciated in our army nor in our navy at present because our officers are not generally familiar from actual contact with airships as an auxiliary. An army is like a man, unless it is fully fit, it is unfit. The value of any new auxiliary in warfare depends upon the use made of it, and this use depends for its application upon a commander familiar with its utility. This familiarity must be acquired during peace, for in war it is too late to experiment and to become expert. It may be said to be invariable that war initiates nothing, but develops everything that has had trial prior to the war. The efforts of both the Russians and Japanese to introduce innovations failed for the want of trained men and officers competent in the specialty.

There is an evident great increase of activity in airships just at present, consequently our government must also make a beginning of taking up aeronautics, but judging from previous experience it can be only a show unless Congress provides the means. Whether the government will follow the same practice as the people in general in this country and wait for final developments abroad before doing anything remains to be seen. This would not be surprising, for it is the system followed in most industrial things. Nearly everything we make use of in this country was perfected abroad before being adopted here, even though originally invented in the United States.

It is, moreover, a common observation that we sometimes adopt those ideas that are just going out of date abroad. The success of the steerable airship has been demonstrated in England, France and Germany, and is admitted as an indispensable military machine. Its greatest objection is its cost. Cost in military essentials is not to be avoided. France has been spending large sums since 1875. It will not now be long before these airships make trips from their capitals to their frontiers faster than railways. We have no airships, nor will there be many unless several times the sum now proposed be given. By the time we get airships it is possible the aeroplane will have succeeded it in other armies. The aeroplane, first successful in the United States, seems likely to be first adopted abroad.

Other nations have already extensive military and naval aeronautical plants which have been built up from year to year. The great sums they are now spending are upon development. We have nothing. A considerable plant will be necessary to commence with. Trained military aeronauts must be made. It will take much time to get ourselves to the position to which other nations have arrived in material and personnel. Then only can development commence. The position we might find ourselves in, in case of sudden attack, is alarming.

The aeroplane, or the airship heavier than air, and not lifted by cumbersome buoyant gas, appears certain to become the airship of the century. This is because of the development of light and powerful engines, liquid fuel, new and lighter metals, and, above all, because every science is continually contributing something to the solution of the problem. It cannot fail of early and universal use. Our Langley and Chanute have pointed the way to accomplish the successful aeroplane and the world is following their reasoning. By the time we get as far as the great military powers

abroad have now reached, the practical unbuoyed airship will have been achieved. There is now a feeling that the problem of practical flight will soon be solved. The fact that machines heavier than air have left the ground for varying distances has created the confidence that more is to follow in such accomplishments. The future is certainly full of promise. It is no longer considered visionary to anticipate that the development will be rapid. It is only recently that the War Department, and the Board of Ordinance and Fortification, were bitterly attacked in Congress for spending money on Langley's flying machine, characterizing Prof. Langley as "a professor wandering in his dreams," and referring to the officials permitting the expenditure as hypnotized. Langley died soon after, too soon to hear that the device of his invention was made to fly by the French. Fortunately, such attacks would now be repelled for there are too many in Congress who have observed the progress of the world in flying machines.

The Wright aeroplane has succeeded. It has accomplished a flight of 24 miles at a speed of 38 miles an hour. The Wright machine is usually said to be a secret. That is only partially true. The machine is not likely to be reproduced till the gifted inventors and the experimenting mechanicians who have solved the problem are suitably rewarded and recognized by our government. There is little doubt but that it will only be a short time till the greatest mechanical triumph of modern times will be properly appreciated.

Abroad, many men of unlimited courage, means and mechanical skill are now working to discover what the Wright brothers have solved. That they will do so soon no aeronaut questions.

The success of the great airships recently developed abroad has awakened the world. With no such ships nor trained aeronauts, it is not difficult to imagine the predicament of this country in case of war. Their importance as a military weapon has impressed every thoughtful mind. Most military men clearly see that the mastering of the air means the mastery for nations. The United States has this mastery within her grasp.

Some Model Aeroplane Experiences and Details of Man-Carrying "Avroplane," by A. V. Roe.

Mr. Roe had four large models of aeroplanes at the Aero Club exhibit in London last April, and won the second prize at the "Daily Mail" contest at Alexandra Palace.

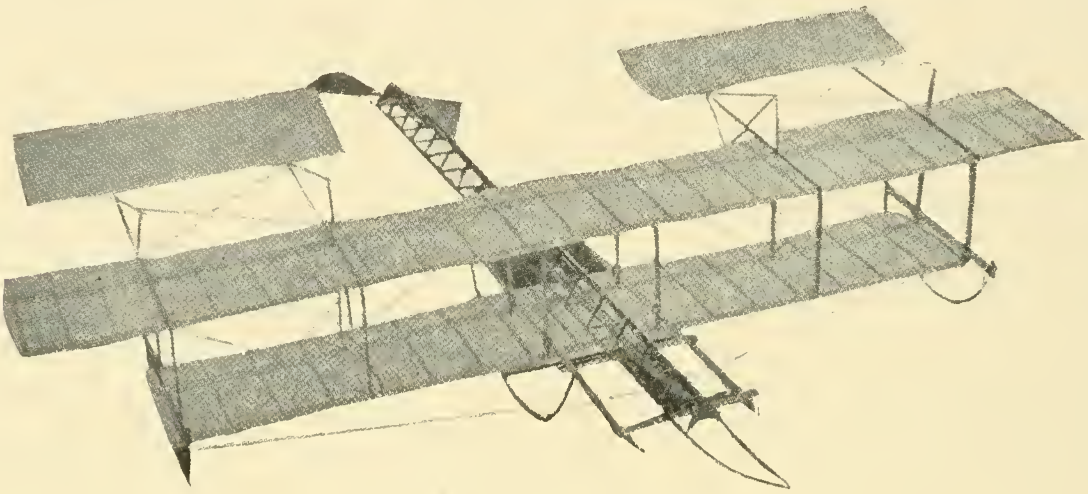
I was hoping to have been able to give an account to the Congress of my motor-driven avroplane and regret to be unable to do so; but as soon as the racing season is over I shall be permitted to erect a shed by the Brooklands Track and carry out my experiments there, for which place it has been specially designed, as the four pneumatic wheels it is mounted on are only 10½ inches in diameter.

But perhaps a few particulars of my model avroplane experiences may be of interest to the Congress. These have been the means of showing me many little things which would most probably take years to find out if only experimenting with full-sized machines had been resorted to. For instance, my model experiments showed me the propeller should be on an average level with the aerocurves; that is, if there are two superimposed aerocurves 10 feet wide and 12 inches apart, and one of same size in front at the same level as upper aerocurve, then the axis of propeller should be placed 3 inches below the upper aerocurve.

I was once very much puzzled with the steering of one of my models, as I had repeatedly proved it should go the opposite way to the one it insisted on going; this was owing to the weight not being sufficiently far forward. If the weight is not correctly placed it can be counteracted by the horizontal steering plane; I also came to the conclusion that vertical rudders were quite out of place on an aeroplane, as these tend to slow up the machine and make it swing round without heeling over,

whereas twisting of the two tips of the horizontal steering plane, provided it be of sufficient tip-to-tip measurement, answers very readily and efficiently.

Many and various were the types I experimented with, up to as many as ten aerocurves one behind each other; and I finally came to the conclusion the following three types were hard to beat: (1) A Langley type, but having the forward planes under control as in my forward steering type; I found this a very steady and excellent machine—it can be made to fly in a fairly straight line owing to the dihedral angle. (2) Forward steering type. The main planes are superposed, having a forward plane nearly as large as one of main planes, fore to aft over planes being about three-quarters of tip-to-tip, this forward steering plane being under complete control with one steering gear somewhat like that of a motor-



THE WINNING ROE MODEL.

car. Turning the steering wheel in the ordinary way raises one side of forward plane whilst the other is lowered. This action readily steers the machine sideways in an efficient manner, but on rocking the steering column, tilts the whole plane up or down for vertical steering. (3) The rear tail steering type. In the case of these two latter types, it is very difficult to send them straight if the planes are not set at an angle, but if horizontal, in the case of a full-sized machine, they should be all the more readily steered. The largest models varied from 8 to 10½ feet tip-to-tip and weighed about one-quarter pound per square foot, giving a speed of about 10 m. p. h. These models were driven by many fine strands of elastic which drove a propeller of 20 inches diameter for smaller type and 22 inches diameter for larger type.

Many flights were obtained varying from 100 feet to 140 feet in length, which gave ample time to gauge the efficiency of the machines, the action of the steering mechanism, equilibrium, etc.

In the case of the rear-tail type, when driven mechanically, the tail is divided into two parts with the propeller in between. It was this type which gained the "Daily Mail" £75 ($375) prize. Its action is somewhat peculiar, as the rear tail does not help to support the machine but otherwise. The air beats on the upper side of tail, thus counteracting the forward weight. This gives a kind of automatic balance. Should the machine go too fast and the tail is not lowered accordingly the machine takes an upward course, which reduces the speed. On the speed being reduced, the downward pressure on the tail becomes less until it is less than the counteracting forward weight. This brings the machine down again and (if not already too near the ground) in so doing increases its speed, thus going up again, continuing to make these switch-back like flights until the ground is reached. Although this type did best at the model flying machine trials mentioned above, I have had more efficient results with my forward steering models and have accordingly built my full-sized machine on the forward steering system.

DETAILS OF FULL SIZED AVROPLANE.

DIMENSIONS—Two main superimposed planes, upper 36 ft., lower 30 ft, both 5′ 4″ wide, front plane 24′ x 5′ 4″, 8′ space between front and rear planes. These aerocurves have hard cutting edges and ribs average ten inches apart, the under surface being perfectly smooth and free from obstructions or any cross members.

AREA AND WEIGHT—Area 480 sq. ft, weight 460 lbs, including myself (148 lbs.), being slightly under one lb. per square foot.

WEIGHT PER HORSEPOWER—Driven by 6 H.P. J. A. P. engine, air cooled, per horsepower, 75 lbs. Prof. Langley proved that one horsepower could carry 208 lbs. through the air at 40 m. p. h., so believe 6 H.P. should suffice, especially in light breezes.

CONSTRUCTION—The central portion, which carries engine, aviator, steering gear, aerocurves, etc., is of long triangular construction, well braced up and mounted on four pneumatic wheels 10½ inches diameter. Above each wheel are spiral springs so as to take shocks when landing. This central chassis can be steered when running along the ground. All parts are so shaped so as to offer the least possible resistance to the air, framework being made from 3¾ x 5/16″ Kauri Pine. It is well braced up by air cutting struts so as to withstand more than twice the strain put upon them when in the air. All surfaces have been considerably overloaded. The actual weight per square foot to insure rigidity when afloat, the machine having to be inverted for this test.

STEERING—Front plane is under complete control with the one steering gear; that is, for vertical steering the steering column is rocked, which moves the front plane up and down. For lateral steering the wheel is turned in the usual way, which raises one side of the plane while the other is lowered. This method of steering has proved very effective in my models.

PROPELLER—Made from steel tubing and magnalium (a metal slightly lighter and stronger than aluminum). It has four blades 6′ 10″ diameter and weighs 12 lbs.: and under 7 lbs. with two blades. These blades can be detached and only two used if desired, angle or pitch can be altered, but pitch set on them is three feet, which would, without slip, give a speed of 50 m. p. h. at 1,600 r. p. m. This should give a speed well over 30 m. p. h. when in the air and machine should rise at 25 m. p. h. I note the French have been reducing their pitch gradually until they are now three feet.

TRANSMISSION—I had a spring drive through two 15″ leaf springs and some India rubber, but have given this up and I am now driving through a clutch, which is more satisfactory. I use Hoffman's ball and thrust bearings, and have sliding universal joint to reduce loss of power through friction as far as possible.

I hope these notes will be the means of helping others as my wish is to see the problem progress, and I feel sure as soon as public demonstrations are given, showing how easily an aeroplane can leave the ground, fly round and alight, then interesting and rapid progress should be made.

Seeing that the hydroplane appears to be arousing interest and attracting serious attention, it may be the means of helping the aeroplane movement along; for, after all, the hydroplane is a modified form of aeroplane. However, when the hydroplane is built sufficiently light and speedy, aeroplanes could be attached. By having the forward hydroplane surface under control, as in my avroplane, it could be steered, when sufficient speed had been gained, out of the water into the air.

But, personally, I prefer at the present stage to experiment over smooth ground like the Brooklands Track, at the same time the hydro-aeroplane way would be very interesting.

Note on Mr. A. V. Roe's Paper, by O. Chanute.

Mr. Roe is to be earnestly thanked for giving us a description of his full-sized motor aeroplane. He evidently desires comment.

He had been led to underestimate the power required by Langley's broad statement that one horsepower could carry 208 pounds through the air at 40 miles per hour. This refers to the plane alone and does not cover the resistance of the framing, motor, aviator, etc. When Langley flew his large models he only sustained 30 pounds per horsepower, and a motor of 6 H.P. will prove quite insufficient for Mr. Roe; particularly if he attempts to rise by running on the ground, as do the French aviators, whose experience also teaches that the wheels and spiral springs generally get broken upon alighting.

Mr. Roe will also find that better results are to be obtained with two blades in the propeller instead of four, as planned.

The strengthening of the wheels and the substitution of a more powerful motor are likely to increase the weight by some 200 pounds, but if all the 480 square feet of area prove effective in lifting, i. e.: if the front plane does a full share, the speed required to leave the ground should be about 30 miles per hour.

ARMY AERONAUTICS FOR DECEMBER.

During the month of December the Aeronautical Division of the Signal Office has been engaged in preparing and perfecting specifications for a dirigible balloon and also for a heavier-than-air flying machine. The advertisement and specification for dirigible balloons were issued and made public by the Chief Signal Officer on December 16th, and proposals will be opened January 15th. The heavier-than-air specification was made public on December 23d, and proposals will be opened February first. The advertisements invite proposals from all inventors and manufacturers, and the Signal Office is receiving daily a great number of inquiries for copies.

Following are the principal requirements:

Dirigible Balloon.

The general dimensions of the dirigible balloon will be determined by the manufacturer, subject to the following conditions:

1. The gas bag shall be designed for inflation with hydrogen, the material for which will be furnished by the Signal Corps. This material is silk, covered with an aluminum preparation, and requires no varnish. It weighs 5.842 ounces per square yard and has a minimum breaking strength of 62½ pounds per inch width. This material for the gas bag will be furnished by the government, and samples may be seen in the office of the Chief Signal Officer of the Army, Washington. Bidders must state in their proposal the number of square yards of the material they will require. The dimensions and shape of the gas bag will be as desired by the manufacturer, except that the length must not exceed 120 feet.

2. Inside the gas bag there will be either one or two ballonets having a total capacity of at least one-sixth the total volume of the gas bag. Leading to the ballonets there will be tubes of proper size connected to a suitable centrifugal blower for maintaining a constant air pressure in the ballonets. The fabric for the ballonets will be supplied by the government. It weighs 2.857 ounces per square yard, and has a minimum tensile strength of 48½ pounds per inch width. Bidders must state in their proposal the number of square yards of this fabric they will require.

3. In the lower part of the ballonet and gas bag, or on the ballonet air tubes near the gas bag, there will be an adjustable automatic valve designed to release air from the ballonet to the outside atmosphere. On the under side of the gas bag

there will be a second adjustable automatic valve of suitable size, so designed as to release hydrogen from the interior of the gas bag to the outside atmosphere. This valve will also be arranged so that it may be opened at will by the pilot.

4. In the upper portion of the gas bag there will be provided a ripping strip covering an opening five inches wide by six feet long, with a red rip cord attached in the usual manner and brought down within reach of the pilot through a suitable gas-tight rubber plug inserted in a wooden ring socket.

5. The suspension system and frame must be designed to have a factor of safety of at least three, taking into account wind strains as well as the weight suspended.

6. A type of frame which can be quickly and easily assembled and taken apart will be considered an advantage.

7. The balloon must be designed to carry two persons having a combined weight of 350 pounds, also at least 100 pounds of ballast which may be used to compensate for increased weight of balloon when operating in rain.

8. The dirigible balloon should be designed to have a speed of twenty miles per hour in still air, but bidders must submit quotations in their proposals for cost depending upon the speed attained during the trial flight, according to the following schedule:

20 miles per hour,	100%.
19 " " "	85%.
18 " " "	70%.
17 " " "	55%.
16 " " "	40%.
Less than 16 miles per hour rejected.	
21 miles per hour,	115%.
22 " " "	130%.
23 " " "	145%.
24 " " "	160%.

9. The speed accomplished during the trial flight will be determined by taking an average of the time over a measured course of between two and five miles, against and with the wind. The time will be taken by a flying start, passing the starting point at full speed at both ends of the course. This test subject to such additional details as the Chief Signal Officer of the Army may prescribe at the time.

10. Provision must be made to carry sufficient fuel for continuous operation of the engine for at least two hours. This will be determined by a trial endurance flight of two hours, during which time the airship will travel continuously at an average speed of at least 70% of that which the airship accomplishes during the trial flight for speed, stated in paragraph 9 of this specification. The engine must have suitable cooling arrangements, so that excessive heating will not occur.

11. Three trials will be allowed for speed as provided for in paragraph 9, and three trials for endurance, as provided for in paragraph 10, and both tests must be completed within a period of thirty days from the date of delivery, the expense of the tests to be borne by the manufacturer.

12. The scheme for ascending and descending and maintaining equilibrium must be regulated by shifting weights, movable planes, using two ballonets, or other approved method. Balancing by the aeronaut changing his position will not be accepted.

13. This dirigible balloon will be provided with a rudder of suitable size, a manometer for indicating the pressure within the gas bag, and all other fittings and appurtenances which will be required for successful and continuous flights, according to this specification.

14. Bidders will be required to furnish with their proposal a certified check amounting to fifteen per cent. of the price stated for the 20-mile speed. Upon making the award for this airship these certified checks will be returned to bidders,

and the successful bidder will be required to furnish a bond, according to Army Regulations, of the amount equal to the price stated for 20-mile speed.

15. Bidders must submit with their proposals drawings to scale showing the general dimensions and shape of the dirigible balloon which they propose to build under this specification; a description of the engine which will be used for the motive power; the material of which the frame will be constructed; sizes of valves, etc. Plans received will not be shown to other bidders.

16. Bidders must furnish evidence that the Government of the United States has the lawful right to use all patented devices or appurtenances which may be part of the dirigible balloon, and that the manufacturers of the dirigible balloon are authorized to convey the same to the Government.

17. The price quoted in proposals must be understood to include the instruction of two men in the handling and operation of this airship. No extra charge for this service will be allowed.

Dynamic Flying Machine.

The general dimensions of the flying machine will be determined by the manufacturer, subject to the following conditions:

1. Bidders must submit with their proposals the following:

(a) Drawings to scale showing the general dimensions and shape of the flying machine which they propose to build under this specification.

(b) Statement of the speed for which it is designed.

(c) Statement of the total surface area of the supporting planes.

(d) Statement of the total weight.

(e) Description of the engine which will be used for motive power.

(f) The material of which the frame, planes, and propellers will be constructed. Plans received will not be shown to other bidders.

2. It is desirable that the flying machine should be designed so that it may be quickly and easily assembled and taken apart and packed for transportation in army wagons. It should be capable of being assembled and put in operating condition in about one hour.

3. The flying machine must be designed to carry two persons having a combined weight of about 350 pounds, also sufficient fuel for a flight of 125 miles.

4. The flying machine should be designed to have a speed of at least 40 miles per hour in still air, but bidders must submit quotations in their proposals for cost depending upon the speed attained during the trial flight, according to the following scale:

40 miles per hour, 100%.
39 " " " 90%.
38 " " " 80%.
37 " " " 70%.
36 " " " 60%
Less than 36 miles per hour, rejected.
41 miles per hour, 110%.
42 " " " 120%.
43 " " " 130%.
44 " " " 140%.

5. The speed accomplished during the trial flight will be determined by taking an average of the time over a measured course of more than five miles, against and with the wind. The time will be taken by a flying start, passing the starting point at full speed at both ends of the course. This test subject to such additional details as the Chief Signal Officer of the Army may prescribe at the time.

6. Before acceptance a trial endurance flight will be required of at least one hour, during which time the flying machine must remain continuously in the air

without landing. It shall return to the starting point and land without any damage that would prevent it immediately starting upon another flight. During this trial flight of one hour it must be steered in all directions without difficulty and at all times under perfect control and equilibrium.

7. Three trials will be allowed for speed as provided for in paragraphs 4 and 5. Three trials for endurance as provided for in paragraph 6, and both tests must be completed within a period of 30 days from the date of delivery. The expense of the tests to be borne by the manufacturer. The place of delivery to the government and trial flights will be at Fort Myer, Virginia.

8. It should be so designed as to ascend in any country which may be encountered in field service. The starting device must be simple and transportable. It should also land in a field without requiring a specially prepared spot and without damaging its structure.

9. It should be provided with some device to permit of a safe descent in case of an accident to the propelling machinery.

10. It should be sufficiently simple in construction and operation to permit an intelligent man to become proficient in its use within a reasonable length of time.

11. Bidders must furnish evidence that the Government of the United States has the lawful right to use all patented devices or appurtenances which may be a part of the flying machine, and that the manufacturers of the flying machine are authorized to convey the same to the government. This refers to the unrestricted right to use the flying machine sold to the government but does not contemplate the exclusive purchase of patent rights for duplicating the flying machine.

12. Bidders will be required to furnish with their proposal a certified check amounting to ten per cent of the price stated for the 40 mile speed. Upon making the award for this flying machine these certified checks will be returned to the bidders and the successful bidder will be required to furnish a bond, according to Army Regulations, of the amount equal to the price stated for 40 mile speed.

13. The price quoted in proposals must be understood to include the instruction of two men in the handling and operation of this flying machine. No extra charge for this service will be allowed.

14. Bidders must state the time which will be required for delivery after receipt of order.

MY FLIGHTS.

By Henry Farman.

The machine on which my recent flights were carried out is of the cubic type. That is to say, it is formed of two linen cubes: a large one at the front 12 meters in length, 2 meters in width and 2 meters in height; the other one smaller, at the rear and attached to the first by means of wooden rods. A point-shaped car finishes this machine and holds the motor, the tanks, the driver's seat and the operating apparatus of the motor. The equilibrator is placed at the front of the car and the rudder at the back.

To leave the ground is not an easy matter, but to fly is still much more difficult. The machine is driven by a two-bladed propeller fitted to a 50 H.P. Antoinette motor.

Every day during two months, I worked hard on my machine, altering, modifying and studying it in all its details so as to have it well in hand. I succeeded in leaving the ground and then managed to make a flight of a distance of 285 meters, thus beating Mr. Santos Dumont's record. From that time, I covered larger distances and flew as far as 770 meters, being 52 seconds in the air; I could have gone further had not the barriers of the military parade obliged me to come down again.

I am now training myself to the turning in the air, a difficulty which I believe I will overcome and hope to win the Deutsch-Archdeacon prize by covering a closed kilometer on a flying machine.

My belief is that all the flying machines constructed up to this present day lack in stability. At every experiment they smash in landing which, it should be remarked, mine never did as yet, although I have made over 200 flights varying between 100 to 500 meters at a height of 6 and 8 meters, once even reaching the height of 15 meters. Besides, my machine is absolutely horizontal when flying. Of course, one of the most important things is the regulation of the motor, which must be perfect. Then, when flying, I have many parts to survey such as: the rudder at the rear, the equilibrator, the advanced ignition, the carburating handle, manometer for petrol pressure, manometer for water pressure and so on, which renders the task much more difficult, but, notwithstanding all this hard starting, I am convinced that much will be done before long and my hopes are illimited in this concern.

THE FLIGHT OF THE BELL KITE.

By Lieut. T. Selfridge, Secretary Aerial Experiment Association.

On December 6 the Aerial Experiment Association completed all their preliminary work and were ready to make a man-flight with the large tetrahedral kite called "The Cygnet."

It consisted of 3,393 wing cells, each cell carrying 541.25 square centimeters of silk. The kite was merely an upper section of a large tetrahedron of 52 cells on an edge. There were 12 layers of cells in the kite. The center of the kite was so arranged that a man could be carried on a ladder running from fore to aft. It was provided with three silk floats which presented a horizontal area of 8 square meters. The kite was to be launched from a rocking cradle carried on a catamaran raft which was to be towed by a tug-boat.

On the above date the kite was towed out in the middle of Bras d'Or Lake. Upon reaching the desired point the tug was headed into the wind and the kite put up in a 30-mile breeze (the wind proper was 21 miles, the speed of the tug 9) with the writer on board. The kite went up without any trouble and flew steadily for about seven minutes when, the wind dying down, the kite descended to the water. Due to lack of foresight of the men on the tug, and also to the unexpected dropping of the wind, the flying line was not cut soon enough and the kite was badly smashed on touching the water by the additional resistance brought to bear on the structure on account of the pressure of the water on the floats. The aviator was promptly picked up by a motor boat which was there for that purpose.

The following data was obtained: average speed of the wind during flight, 26 miles; angle of instance the kite with the wind, 20°; the pull on the line, 309 pounds; the angle of the flying line with the horizontal, 10°; the total weight carried up, 600 pounds.

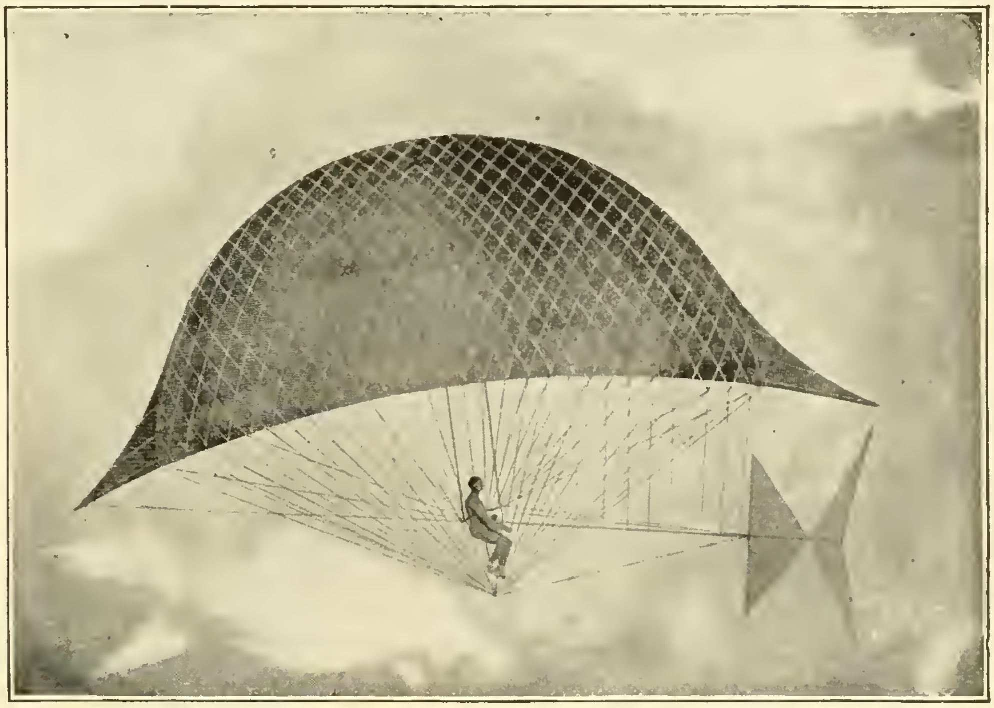
The kite was completely demolished but the loss was not as great as would seem as it had served its purpose by affording this opportunity for obtaining the above information.

The headquarters of the association have been transferred to Hammondsport, N. Y., for the winter, at the shops of the G. H. Curtiss Motor Co., where it will continue its work which is, as yet, in the elementary stage.

DIRIGIBLE BALLOONS WITH SCREW IN FRONT.

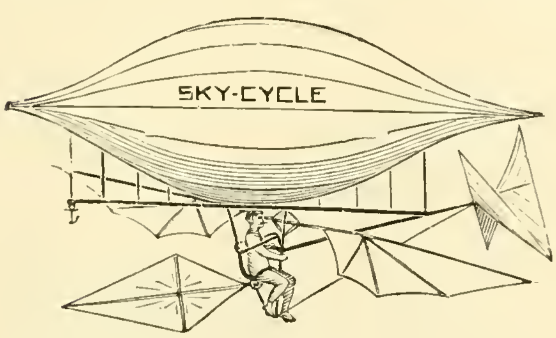
By Carl E. Myers.

Question having arisen regarding the early appearance of a propeller placed at the forward end of the airship or dirigible balloon, claimed by some one as a recent invention, I wish to state that I used such an arrangment on my hand-and-foot propelled Gas Kite, or Aerial Velocipede, to draw the gas vessel up an inclined plane, to fall again by gravity, 1879-80-81, when I adapted it to my Skycycle airship for both forward and backward movement with aeroplane guidance, till 1900, and then applied it to my Electric Aerial Torpedo, at St. Louis, where it made 120 half-hour flights, sometimes pulling, and oftener pushing, the frame or keel of the gas vessel.



Gas Kite, No. 1.
Combined hand and foot power. Chainless gear, 1881.

Mrs. Myers applied such screw propulsion to the ordinary hydrogen gas balloon car in 1880. About this time, or before, a 4-bladed propeller was used by Quinlain to draw the airship of Prof. Richell at Hartford, Conn.



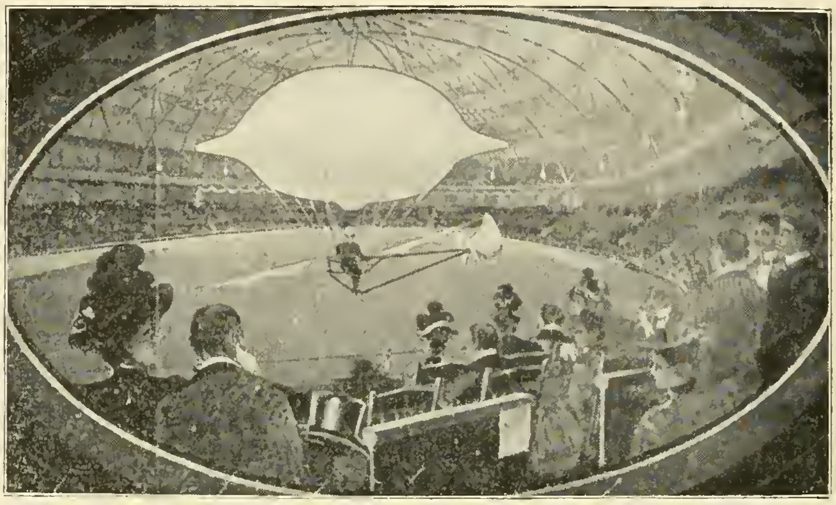
Skycycle at Saratoga Springs, N. Y., 1890.

Skycycle which flew from Brooklyn Navy Yard over New York, 1895.

Santos-Dumont's airship No. 4 was arranged to pull by screw propeller, 1900. The noted airship "La France", built by Renard and Krebs in 1884, used the front propeller. In 1843 Monck Mason designed and built the small round ended model of an airship with screw at one end of a keel and a rudder at the other. Some years later Bell made a first ascension from Vauxhall Garden with a similar airship, with no great success.

I am unable to trace any earlier flight. Certainly no one invented this feature so late as 1900. Its use is of doubtful advantage with any motor vessel

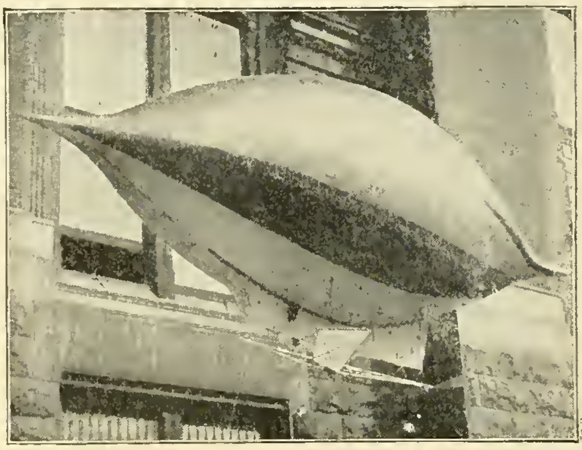
in air or water. I made use of it in my gas kite to pull it forward like a kite drawn by its string. The waste air was also flung against the under surface of the gas-buoyed kite to aid its buoyancy. This vessel was steered solely by tipping it up or down, or to either side through change of the rider's position or weight. The same was true of my later Skycycle, patented 1897, application filed, 1889. Several of these machines were built and many hundred flights made, ranging over 13 states. 120 half-hour skycycle flights were also made within the St. Louis coliseum, 1900.



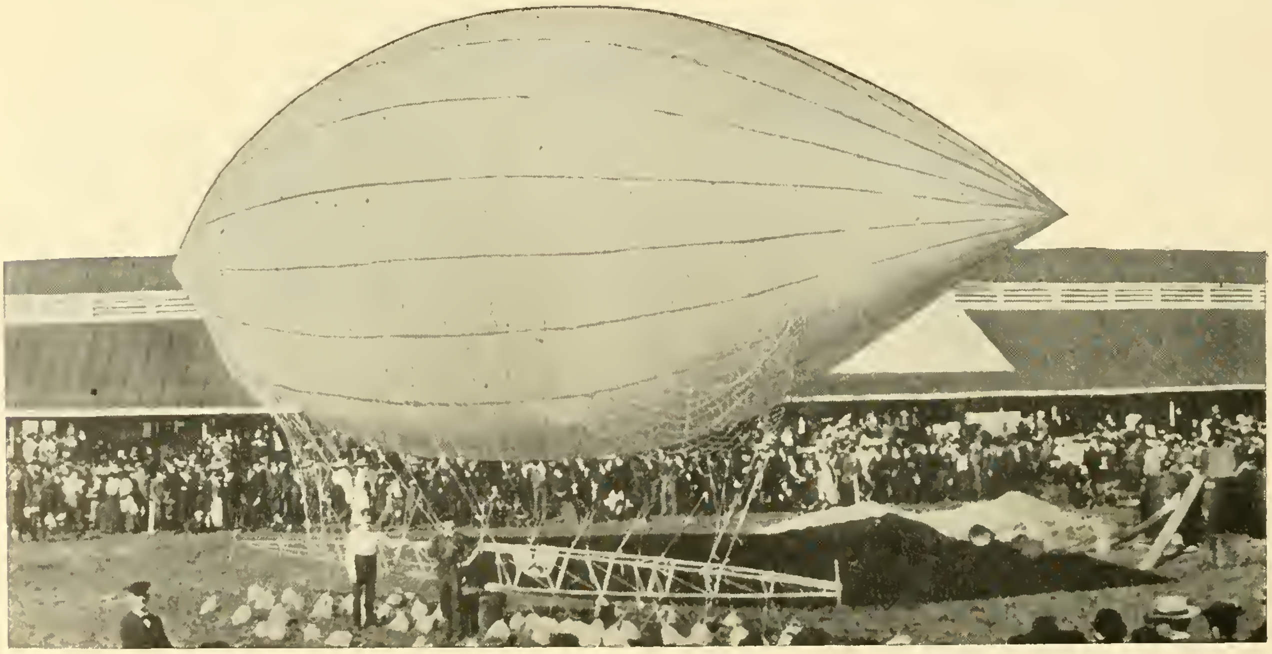
Skycycle which made 120 flights at St. Louis Coliseum, 1900.

Originally a rudder was used for guidance, but was later abandoned for steering aeroplanes. I have never found the pull of a front screw to equal the push of a rear screw in an airship or boat on water.

4-blade Metal propeller of "Kingfishen," in front, with steering paddle wheels on sides; rudder in rear.



Electrical Aerial Torpedo, with screw draft and steering aeroplane. Made 120 flights in 1900.



No. 19. Made flights in 1907.

THE ACCELERATION OF THE WIND OVER MOUNTAINS.

By S. P. Fergusson.

Referring to the remarks of Professors Moore and Rotch upon the paper of M. Gasnier in the November American Magazine of Aeronautics, it may be of interest to some of the readers to know what has been ascertained regarding the influence of mountains upon the weather in their vicinity.

Proof that the wind is higher on mountains than in the free air at the same height was first published by Mr. H. H. Clayton in the *American Meteorological Journal*, July, 1891. Also, at this same time he suggested as an explanation that the air flowing over mountains is accelerated, just as water moving over a dam is more rapid than that of the general current of the river. The above results were derived from observations of the height and velocity of clouds.

Between 1900 and 1904, meteorological records obtained in the free air by means of kites or balloons by Mr. Dines in Scotland and by Dr. Assmann in Germany were compared with records made on Ben Nevis and the Brocken. The results obtained were contrary to my own beliefs, and thinking it probable that the difference observed between the mountain and the free air, in part, might be due to the great distances between the kite stations and the mountains (in neither case less than 90 kilometers) I decided upon a systematic investigation of the problem. Having but my own small means, and the time usually taken for my annual vacations to depend upon, the preparation of an adequate equipment for the work required all my spare time from June, 1904, until August, 1905, this work including the construction of four kites, a suitable reel for flying the kites, and four meteorographs, all designed and constructed especially for the work. All this was accomplished without assistance of any kind. Mount Washington, N. H., was selected for this study partly because of its height and partly because the summit is occupied during two months of the year. Mr. Frank H. Burt, editor of the newspaper *Among the Clouds*, published on the summit, kindly made all observations and records on the summit, while the kites were flown by me in the Ammonoosuc valley 19 kilometers distant and 1,500 meters lower than the summit of Mount Washington.

The first comparison of Mt. Washington and the free air was obtained on August 24, 1905, by means of automatic recording instruments. The temperature was found to be lower, and the wind velocity much higher on the summit than in the free air, the details of the experiments were published in *Among the Clouds* on September 10, 1905, and in *Science*, April 27, 1906.

A second expedition to Mount Washington was conducted by me in August and September, 1906, and a third in July, 1907, a part of the cost of the former being paid from a grant allowed me from the Hodgkins Fund held by the Smithsonian Institution. In all, about sixteen kite flights have been made and important data obtained concerning the influence of the mountain on the weather in its vicinity. During August, 1908, a fourth expedition will attempt to ascertain, by means of kites flown from the summit, the extent to which the mountain influences the wind passing over it, also will study other phenomena peculiar to meteorology of mountains.

Mr. Clayton is of the opinion that the increase of speed of the balloon passing over mountains may not be real, but an effect of perspective. I fully agree with this, for it seems improbable that, unless the balloon passed very near the mountain-top, the acceleration of the wind would extend so high as to be perceived from a balloon.

AERONAUTIC CALENDAR.

Dec. 8.—Aeroplane race at Issy les Moulineaux.

1911.—International assembly of dirigibles in Italy, under the auspices of the Societa Aeronautica Italiana.

AERO CLUB OF AMERICA.

The second of the series of monthly dinners and smokers was held by the courtesy of The Autuomobile Club of America in their main hall on Tuesday evening, January 7.

The annual banquet will be held at the St. Regis Hotel on Saturday, March 7, 1908.

AERO CLUB OF NEW ENGLAND—NEW TROPHY.

By Alfred R. Shrigley, Secretary.

As showing the wide-spreading interest in ballooning, it is of interest to note that the Aero Club of New England has received the following offer: "The proprietors of the Poland Spring and hotels, through the Aero Club of New England, hereby beg to offer to the pilot of any balloon starting 150 miles from Poland Spring, who lands his balloon within two miles of this place, a silver cup valued at not less than $100, provided we are advised before the ascension is made that an attempt will be made to win the cup." Signed, Edward P. Ricker, President.

NEW AERO CLUBS IN AMERICA.

Aero Club of Ohio.

On December 10 the "Aero Club of Ohio" was formed. Johnson Sherrick was elected president; Marshall C. Barber, vice-president; Isaac Harter, treasurer; Dr. Josiah Hartzell, secretary. The club started with twenty members, among them Frank S. Lahm, father of Lieutenant Lahm; Walter Wellman and Consul-General Robert P. Skinner.

The first ascent under the new club's auspices was made on December 20 by Frank S. Lahm, Joseph M. Blake and Gordon Mather.

The evening before the president entertained a number of the members at a banquet in honor of Messrs. Stevens and Lahm.

The club has purchased from A. Leo Stevens the balloon "Psyche," formerly owned by J. C. McCoy.

Aero Club in Louisville, Ky.

It is very likely that Louisville will have an aero club in the near future. The idea is being agitated by J. L. Gribble and P. S. Hudson, who are "old-time" aeronauts and dirigible pilots. Already twenty-five, it is said, have signified their intention of joining if the club should be started. Both Mr. Gribble and Mr. Hudson were in St. Louis for the Gordon Bennett where they renewed old acquaintanceship with Captain Baldwin.

The plan for the first event, which has been outlined, is to attempt a transcontinental balloon race from Denver east, in an effort to break the world's long distance record. It is believed that if a balloon could get in front of one of the storms which move eastward across the continent, a new record could be established.

AERONAUTIQUE CLUB OF CHICAGO.

By C. H. Perrigo, Secretary.

Soon after the great balloon race at St. Louis a meeting, composed of representative business and professional men, was held at the Auditorium Annex in Chicago and the Aeronautique Club of Chicago was organized.

The following officers were elected: President, C. A. Coey; first vice-president, Chas. E. Gregory; second vice-president, Geo. R. Lawrence; treasurer, H. C. Foster;

secretary, C. H. Perrigo; attorney, Benj. Levering; aeronautical engineer, Capt. Raymond Anglemire.

The club has ordered a large touring balloon built to be ready early in the spring. Our president, Mr. C. A. Coey, who has a national reputation for daring in auto races, has decided to own a balloon which he thinks will be able to take the long distance prize in any contest he may enter.

It is the intention of the club to hold balloon races from Chicago annually. A prize cup will be offered, also substantial cash prizes. As soon as it was announced that we were going to hold races one of the leading men of Chicago offered to present the club with a cup costing $1,000 to be raced for. We shall hold the races some time in July or August. The first day's race will be for long distance balloons; the second and third days will be for airships and aeroplanes. Entries are invited from clubs or individual owners of balloons who may wish to compete. Arrangements are being made for the use of one of the large race tracks near the city, to be fitted up for holding the races and a permanent home where the members may make ascensions at any time. The headquarters of the club is at 1424 Michigan Avenue.

AERO CLUB OF THE UNITED KINGDOM.

By Harold E. Perrin, Secretary.

The annual dinner of the Aero Club of the U. K. was held at the Savoy Hotel on Tuesday, the 26th of November. The company present included Mr. Patrick Y. Alexander, Mr. Griffith Brewer, Admiral Sir Charles Campbell, Sir Morgan Crofton and Lady Crofton, Sir Hugo de Bathe, Baron Deutsch de la Meurthe, Mr. J. Z. Ferranti, Captain Grubb, R. E., of the War Office; the Hon. Assheton Harbord and the Hon. Mrs. Assheton Harbord, General Hart, Prof. A. K. Huntington, Mr. V. Ker-Seymer, Dr. W. J. S. Lockyer, Lord Montagu of Beaulieu, Mr. J. T. C. Moore-Brabazon, Mr. C. F. Pollock, the Hon. C. S. Rolls, Lord Royston, Brig.-Gen. R. M. Ruck, R. E., Mr. Winthrop E. Scarritt, Admiral of the Fleet Sir Edward Seymour, K. C. M. G., Dr. W. N. Shaw, the head of the Meteorological office; Mr. F. R. Simms, Col. Templer and Mrs. Templer, Col. F. C. Trollop, Mr. Roger W. Wallace, and Prof. Waynforth.

The toast of "The Aero Club" was proposed by the Chairman Mr. Roger W. Wallace, K. C., who informed the company present that Mr. Deutsch had promised to come over to England in his airship the "Ville de Paris," a statement which was much applauded. He also announced that Lord Northcliffe had offered another valuable prize for motor-driven aeroplanes to be competed for in England. Lord Montagu of Beaulieu then spoke upon the future of aerial navigation, and Admiral Sir Charles Campbell proposed the toast of "The Guests." The Admiral alluded to the great value that aerial navigation would be as an aid to naval warfare in future.

Admiral Sir Edward Seymour, K. C. M. G., Admiral of the British Fleet, also made a most interesting speech.

Mr. Henri Deutsch de la Meurthe, who had come over from Paris specially for the dinner, replied to the toast of "The Guests" in a speech which was greatly appreciated. He looked forward, he said, to paying a visit to England in his airship the "Ville de Paris," a model of which he kindly presented to the Aero Club of the United Kingdom.

The Hon. C. S. Rolls proposed "The Health of the Chairman." He congratulated the club upon having as its chairman Mr. R. W. Wallace, who had done so much pioneer work in connection with automobilism and was now keenly interested in aeronautics. Mr. Rolls was very pleased that the club had with them that night Mr. Winthrop Scarritt, a prominent member of the Aero Club of America, who was one of the leaders of modern sports in America, and is governor and past president of the Automobile Club of America. The club, he said, were very

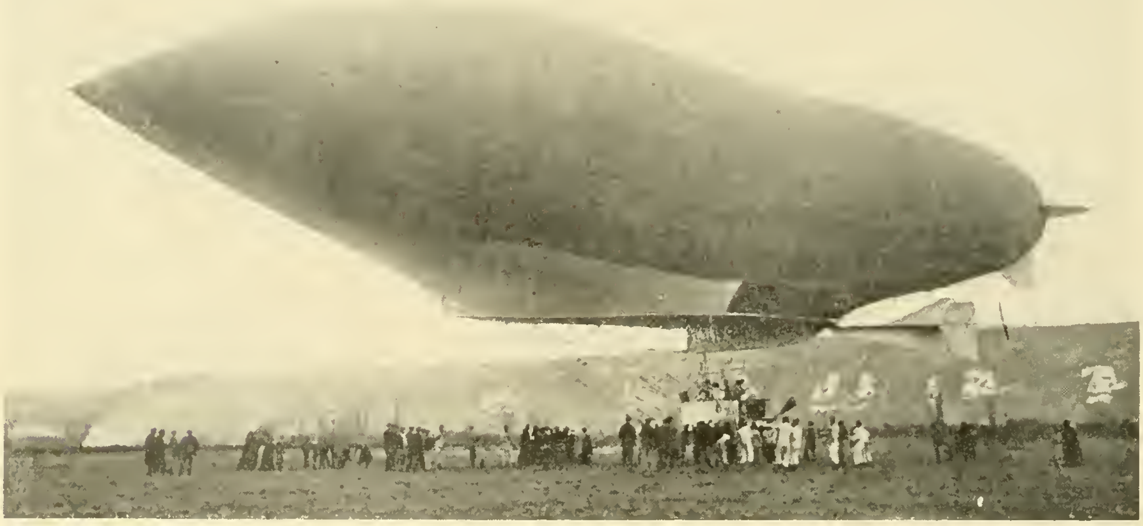
fortunate in having Mr. Deutsch with them that night, who took such a prominent part in furthering the cause of aeronautics. Mr. Rolls added that we in England owed a great deal to the members of the Aero Club de France for the present state of development and perfection to which the modern balloons and the sport of ballooning had been brought.

THE LOST "LA PATRIE."

On Saturday, November 30, after having sailed from Paris to Verdun, "La Patrie" was being employed in reconnoitreing from Verdun when the engine became disabled through the mechanic's clothing catching in the gearing. It was thought the repair could be made quickly and the ship was allowed to drift before the wind. Dusk came on, however, before the work was finished and it was decided to make an immediate descent, which took place at Souhesmes.

Work on the engine was commenced the following morning and continued all day, being only completed about quarter of eight at night.

The wind had been increasing in force and by eight o'clock had assumed the proportions of a gale. It would seem that 180 men would be sufficient to hold an



Goerz Photo

airship, but in an exceedingly heavy gust of wind the ship tore itself loose from the restraining ropes and sailed away to the westward. An officer tried to reach the ripping cord but was unsuccessful in the attempt.

During the night the ship sailed across France towards Saint Lo, across the English Channel and was seen over South Wales at eight o'clock the following morning. After leaving Wales, "Patrie" turned northeast, passing above Lloyd's Signal Station at Torr Head, opposite the coast of Argyllshire, at about four o'clock on Sunday evening. Later in the day the ship touched the ground near Ballysallough, County Down, Ireland. "During the course of its erratic wanderings, it seems that the "Patrie" collided with a hill, and after tearing up the ground for some little distance, finally sailed through a farmyard wall, shedding in its passage a propeller and sundry tins of oil."

Lightened by the loss of these articles, the ship "rose again and ascended into Heaven," and was last seen heading for the North Atlantic, there no doubt to travel about like the Wandering Jew until it finds a grave. An official of the English War Department took possession of the parts on behalf of the French Government.

GORDON BENNETT 1908.

Berlin has been definitely settled upon for the start of the 1908 Gordon Bennett, to be held during October. Dr. Broeckelmann is to be one of the three German defendants of the cup.

It is rumored that the Japanese aeronauts desire to enter but this is impossible as there is no club in Japan of which anyone has knowledge, and if so, it certainly is not a member of the Federation.

The Swedish Club is to enter this year. Imagine an international balloon race from Stockholm!

The Real Aero Club de Espana has entered three balloons.

NEW AERO PRIZES.

To the different prizes for aviation, instituted by the Aero Club of France and the Commission de Aviation, prizes which are being exposed to such meritorious assaults, is added a gold medal offered by Mr. Albert C. Triaca, member of the A. C. A., and director of the new aeronautic school in New York. This medal will be given to the constructor of the motor which shall be mounted in the flying machine winning the Deutsch-Archdeacon aviation prize of $10,000.

New Aero Club of New England trophy. Notice elsewhere in this issue.

The aeronautical exposition at Turin in 1908 is to put up two prizes, one of $50,000 for dirigible balloons and one of $20,000 for "aeroplanes"—we take it for granted this is meant to include all gasless types. The king will also create a Royal cup.

The first of December, Lord Northcliffe, in the name of the Daily Mail, announced the creation of a prize of $500 to the aeroplane which executes a flight of half a mile in a circle.

POINTS IN BUYING A BALLOON OR AIRSHIP.

Translated.

"Owing to several inferior balloons being sold last season by inexperienced manufacturers, which were faulty in construction and dangerous, we desire to point out a few essentials: Who is the constructor? Can he give references? Is he an experienced man? Where is his factory? Is he reliable? Has he ever made ascensions? Does he know the breaking strain? For whom has he built balloons? Ask the purchasers."

DECEMBER BALLOON ASCENSIONS.

Dec. 20. Frank S. Lahm, Joseph M. Blake and Gordon Mather (Aero Club of Ohio) in the balloon "Ohio" from Canton, O., at 12:55 p.m., landing near Pulaski, Pa., at 3:40 p.m. Distance, 68 miles. Duration, 2 hours, 45 minutes. Highest altitude, 3000 feet.

Dec. 27. Albert C. Triaca (Aero Club of America) and Ernest Barbotte in the "Aero Club No. 4" from St. Cloud, Paris, at 1:30 p.m., landing at 2:45 p.m., near La Fertesous-Jouarre, France. The trip was made by Mr. Triaca in qualifying for pilot's license. On landing he neglected to release the gas, and a puff of wind carried the balloon away. It was afterward recovered.

Dec. 27. C. A. Coey and George R. Lawrence (Aeronautique Club of Chicago) in the "Zenith" at Chicago. Soon after the start a gust of wind blew the balloon against a tree which cut some of the ropes attaching the basket to the bag and dropped the aeronauts out. Luckily they sustained no injury.

Winthrop E. Scarritt (Aero Club of America) made a trip from London with the Hon. C. S. Rolls but details are not available. It is reported that Mr. Scarritt jumped from the balloon in landing. Thus lightened, it reascended with the Honorable Rolls. Query, did the former Automobile Club president get "cold feet?" If so, it is the first instance recorded in the life of Mr. Scarritt.

CHRONOLOGY OF PRINCIPAL EVENTS.

Owing to the bad weather during December and the alterations being made in the Farman, Bleriot and Santos Dumont machines, few flights have been made.

Santos Dumont has now two propellers in front, driven in opposite directions by a leather belt. In the first trial of the new arrangement, the belt fouled one of the propellers, a wooden frame covered with silk.

Pischoff practiced and succeeded in making several flights of 50 to 100 yards.

The Ferber-Levavasseur "Antoinette" has been completed and will be out soon.

Dec. 1. Bleriot made a few trial flights. Only 24 meters was covered in the first flight; in the second 100 meters was made, and in the third, 150 meters at a height of about 10 meters. During flight the apparatus gave a sudden lurch and one wing came in touch with the ground and was broken—likewise the propeller. Bleriot started at once to repair the damage.

Dec. 6. Bleriot succeeded in making two or three very good flights; the first of which was a semi-circular course of about 160 yards, the second a straight flight of about 600 yards, and the third, another straight flight of 500 yards. A height of about 40 meters was attained which evidently disturbed the equanimity of the aviator and the engine was suddenly stopped and landing made. The frame was bent by the fall and a propeller blade and a wheel broken.

Farman's machine while being brought out toppled over, due, apparently, to the recent alterations which resulted in the lightening of the tail, and some considerable damage was done to the framework.

Dec. 18. Bleriot was able to cover about 150 meters but in a succeeding flight the machine broke in two while in the air and the aviator narrowly escaped serious injury. In this flight the machine started into the air at a considerable angle and soon was quite high. The altitude was lowered, however, and at a distance of 100 meters the forward planes of the machine seemed to snap off at the shoulders and turn upward. The machine dropped swiftly to the ground. A correspondent writes: "All present agreed that the Bleriot apparatus was about the most dangerous type of aeroplane yet brought out. Its movements in the air are too quick and no man can possibly follow all its rapid cuts and thrusts as they are executed and compensate for them with the rudder."

Dec. 20. Farman made a flight of nearly half a kilometer. During the day many trials had been made but of no great length. At dusk the flight of nearly 500 meters was accomplished and gave the spectators to judging the apparatus in its altered form. The rear cell has been reduced in size and a long flight is necessary to determine the stability. It is said that there was a tendency for the machine to sway, though turning movements were executed more easily than with a larger rear cell. The motor has been fitted with a magneto and carbureter and it will operate a new propeller. A new water cooling-system has been fitted also.

Dec. 21. Farman was able to fly the entire length of the grounds at Issy. He found that by warming the gasoline in the jacket of the motor that he could get 1050 revolutions out of the engine, or 50 more than the usual speed. He anticipates still further accelerating the speed to 1100 r.p.m.

Dec. 30. Farman completed a circle of a kilometer in length but touched the ground for an instant to avoid hitting the bystanders.

DECEMBER INCORPORATIONS.

The Aerial Navigation Company of America, of Guthrie and Clinton, N. Y.; capital stock $1,000,000. Incorporators, Edward D. Cronin and Fred Knowlton, of New York City; H. W. Pentecost of Guthrie.

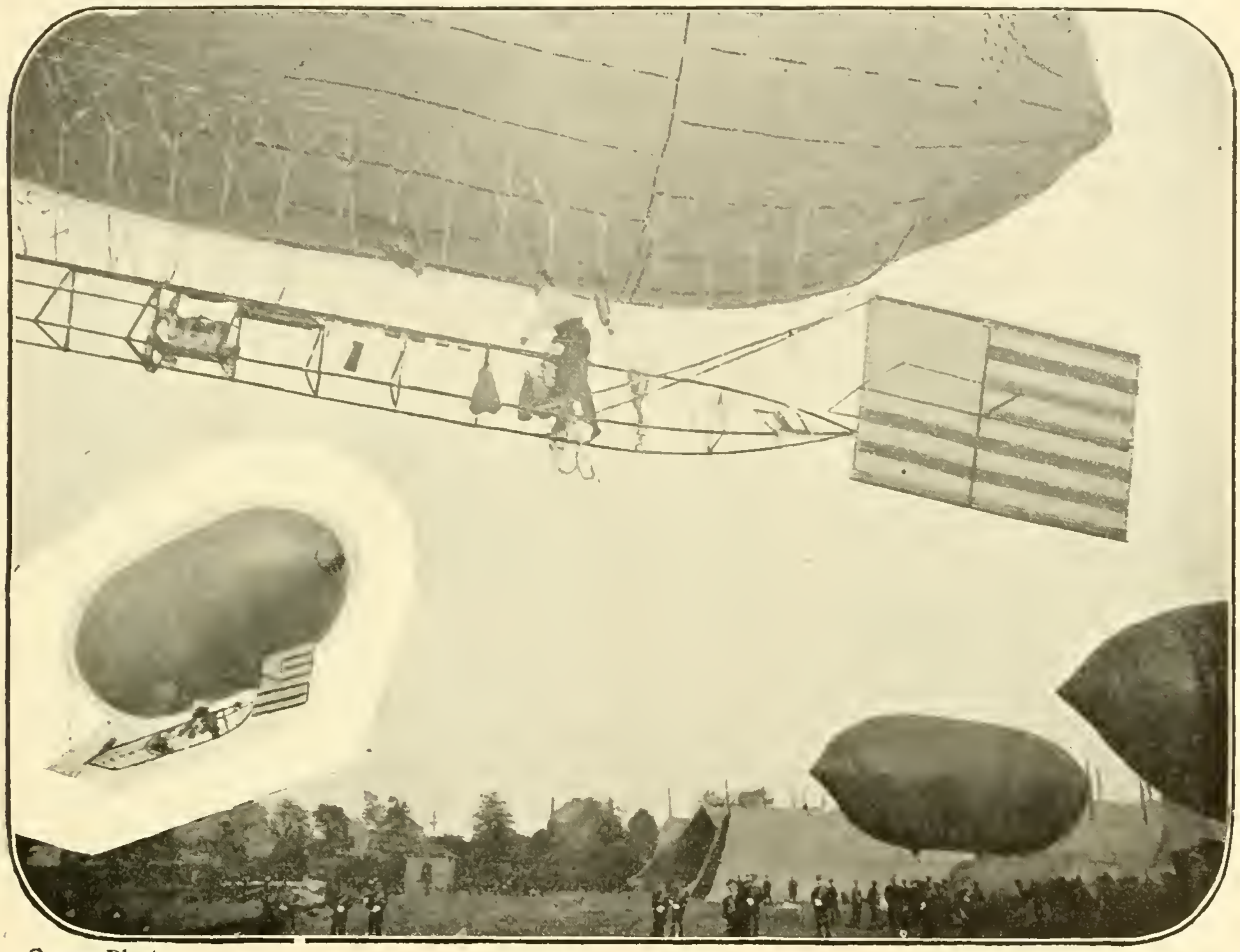
The Ernst Flying Machine Co. of Dundee Lake, N. J., has been incorporated with $25,000 capital to manufacture "flying machines and airships."

THE CALIFORNIA ARROW

Carl Dienstbach

On the 19th of October, 1902, Santos Dumont won the Deutsch prize, the first one ever offered for an airship's performance, by a trip from the outskirts of Paris, around the Eiffel Tower and back. Then started that remarkable series of aerial trips which to the lay mind furnished a last and conclusive proof of the practicability of aerial navigation, and, in fact, fairly revolutionized public opinion.

One year later an American aeronaut, with a farsightedness resulting from long years of experience as an aerial performer, first merely an athlete on the high trapeze, tight-rope, etc., later an aeronaut with hot air and gas balloons, and in parachute jumps (which he was the first one to introduce to this country), realized that to keep up with the times he would needs henceforth have to make a navigable airship, the instrument with which to exhibit his skill. And with the confidence given from perfecting a great



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CAPTAIN THOMAS S. BALDWIN'S CALIFORNIA ARROW AT THE ST. LOUIS CONTESTS.

deal of aerial apparatus, started to build one. In his design he was governed only by a sound practical judgment as to the principal requirements of the case, and the result of his labors was the first thoroughly practical motor air vehicle in America, a type in which, so far, nothing essential has been changed but which has been imitated by many on account of its excellent qualities.

While several features of his invention were similar to Santos Dumont's, there were also essential and far-reaching differences. The frame and the gas bag were more nearly made one piece by enclosing the latter into a special sort of netting, which, owing to its fineness, would produce but little friction or "drag" in the air but increase the staunchness and solidity of the bag, at the same time preventing the balloon from ever becoming loose and flabby below the equator by loss of gas, and saving to a great extent the necessity of an inside air-bag (or balloonet) with blower for keeping the envelope tight (as the netting would in such cases merely flatten the sides and thus decrease the capacity of the gas space). The netting also allowed him eventually to put the frame nearer to the gas bag than ever attempted before. Again the propeller was placed in front and its two blades were given a slight slant towards the axis, which would throw the full force of its draft against the two cylinder, five horse-power motor

to keep it cool. The most obvious change, however, was in the method of operating. The man was not put into a basket from which he shifted a guide rope for vertical, and turned a wheel for horizontal steering. Instead, he rode astride the back of the frame, as on horseback and worked his rudder by tiller ropes, as with a bridle, allowing him to steer from almost any position on the frame. It will be seen how nice and free was that position and how favorable to the development of a high skill, for the longitudinal trim, i.e., the position, horizontal or inclined, of the ship's "keel," is thus controlled by the aeronaut himself stepping back and forth on the frame. The rudder was made especially large to insure a quick effect in all sorts of aerial disturbances, eddies, gusts, ascending or descending currents, etc.

Captain Thomas S. Baldwin, for it is of his invention that we are here speaking, also showed an especially keen intuition in selecting a rather blunt shape for the bag of his first airship. In this he was quite ahead of Santos Dumont. The latter made his first ships comparatively long and thin, without realizing at the time, that the un-

BALDWIN'S AIRSHIP SHOWING TWIN PROPELLER.

avoidable pitching would render the theoretical advantages of this shape for speed rather illusionary in practice, not to mention the long heavy frame suspended far below the bag needed under these conditions, and other practical difficulties. Santos Dumont discovered not without a little surprise, that when he had at last adopted a short, egg-shaped bag for his No. 9, his "runabout," he obtained a more hardy; reliable and controllable craft, without a very appreciable falling off in speed. Here, however, he overlooked the advantageous possibility of placing the frame very near to the envelope, which Baldwin, on the contrary, was quick to see. That shortness of the bag has the further advantage of making the shifting of the aeronaut's weight take a more powerful and quick effect on the longitudinal trim, especially with the shape originally adopted by Baldwin—rather symmetrical at both ends. A design and shape resulted, which, within the limits of its fundamental qualities—though, of course, a blunt shape is less favorable to speed than an elongated one—*proved so efficient and, especially offered so many chances for the development of the highest skill on the part of the operator*, that at the recent races in St. Louis, exclusively contested by ships of this exact type, the German expert, Captain Hildebrandt of the Military Aeronautical Department, became truly enthusiastic about Captain Baldwin's performances, especially after Professor Rotch, the famous director of the Blue Hill Meteorological Observatory, had helped him to ascertain how strongly the wind was really blowing, against which the thick set, sturdy little monster was yet able to hold its own.

But to return to the history of the case. That first fully practical American airship was very prettily and aptly named by its inventor, in whom his friends are ready to recognize something of a poetical vein, the "*California Arrow*." After a number of very promising trips under his own guidance at the place of its construction, California, the ship was taken to the St. Louis Exposition, which had just offered large prices for airship competitions and given a wonderful publicity to the whole subject of aerial navigation. No serious competitors for the "Arrow" had turned up from this side of the ocean, and all seemed to go well until the trials were actually going to commence. Then it was found that with the poor quality of gas furnished by the Exposition authorities, made in an imported apparatus for which no experienced operator could be found; and a strengthened, heavier frame; and the addition of a guide rope, that was found indispensable under the local conditions, Mr. Baldwin's own weight was by thirty pounds too heavy for the machine to lift. It was then that a young, light weight man, Roy Knabenshue stepped into the breach with his offer to run the ship, though not being an aeronaut. Captain Baldwin consented, as he knew that the art of operating could comparatively easily be mastered even by a novice if he were properly shown how, while it

THE FIRST FLIGHT OF THE TWIN SCREW SHIP AT HAMMONDSPORT, JUNE 27, 1907.

had been a trying task even for the experienced aeronaut before the novel requirements had been thoroughly learned and understood. Knabenshue proved an apt pupil and the "*California Arrow*" made such a fine showing, even at that initial stage, that it eventually saved all the Exposition's aeronautical prestige and incidentally reaped the full benefit of the wide publicity given to the announcements of the intended contest. The latter was indeed yet to take place in St. Louis, four years later, and between duplicates of that first "*California Arrow*."

During the first flights over the Exposition grounds it had already become apparent that a new line of activity had actually been started, and that the airship would find its place "ready made" as the principal attraction at the great public gatherings in the open air. It was only to be regretted that Baldwin was so modest about coming forward with his own person. Instead of making at once such changes as would have made it possible to resume quickly the operation of his ship himself, he seemed long obvious of the fact that the credit would rest, for the great "blind" mass of the public, with the men who actually were "running" the ship. As a reputation readily attracts prospective managers, Knabenshue left his old master, after less than a year, to start building his own ship. The latter became, of course, a close copy of the "*Arrow*" and the only departure the constructor felt able to afford consisted in changing the form of the gas bag, which thereby lost much of its trim appearance.

The original ship had, in the meantime, been taken over by a stock company, which made a futile attempt at exploiting its capacity commercially on a very prematurely large scale. Captain Baldwin then built another one, and to save expense made it again too small for his own use, finding in Lincoln Beachy another lightweight gifted substitute. His eye for detecting ability had deceived him still less in this case, for the new "*Arrow*," at the Exposition in Portland, Oregon, 1905, was soon to make 23 flights and return to the place of starting, out of 25. Beachy got the ship under such fine control, that runs through the streets of Portland, as it were, landing on the roofs of skyscrapers and delivering a letter by airship from the Exposition to the City and carrying back the answer, was easy for him. The time of leaving his teacher, however, came for him right after the closing of that Exposition and now Captain Baldwin fully realized the advantage of being his own operator.

A third "*Arrow*" was built and proved a distinct advance. The framing had now been brought into such close proximity to the envelope that gas bag, netting and frame became all one solid whole, thus allowing the ship to literally "stand on its head." If one recalls the very serious trouble twice resulting from even a comparatively slight tilting of Santos Dumont's No. 7, the significance and advantage for safety of that fact is readily recognized. An essential improvement could also be noticed in the motor, now with four cylinders in a row and lighter and stronger, owing to increased refinement of design. Being very reliable, it could be fully controlled by the throttle alone, and as an "aerial chauffeur" has, anyway, to watch too many different things at once, that simplicity can be hardly too highly appreciated. Quite as important for truly satisfactory results is, however, the ship's complete "tuning up." All the ropes must, for instance, have just the right tension, the netting in the finest trim, motor and rudder obey to the slightest touch and so has the hard inflated gas bag to answer at once to any little shifting of the operator's weight on the framing.

Captain Baldwin's latest craft possessed all these qualities to such a marked degree as to become the very ship for the amateur's use. Quite recently Mr. Augustus Post, Secretary of the Aero Club of America, made very creditable flights with it, having had no more previous schooling that what he could derive from closely watching the performance and a few concise instructions.

In 1906 the Captain had a record of 51 returns to the starting point in 53 flights at different localities. During 1907 Captain Baldwin made 92 flights, returning to the starting point 91 times. In the Fall of 1907 he took part in that splendid airship race, the very first of its kind, which followed the start for the Gordon Bennett long distance cup race for balloons, in Saint Louis. The latter was on Monday, the former scheduled for Wednesday and he improved the occasion on the intervening Tuesday, when a great crowd had assembled to witness promised contests of gasless flying machines, which did not take place for obvious reasons, by giving a little unofficial exhibition of the possibilities of his apparatus.

To watch him during that performance was certainly a wonderful sight. He had taken off his coat and the folds of his shirt flapping behind him in the strong draught produced by the ship's speedy motion, resembled the fluttering of a flag in a stiff breeze. On that day the wind was very irregular and the airship was trying to "prance" like a frightened horse, but beautifully restrained by the evidently marvelous skill of the operator. It proved really a fascinating sight to watch this subduing of the wind. A young German, former lieutenant, who saw it for the first time, became, for instance, entirely elated with enthusiasm. To those who have not seen it, it would seem really nearly impossible to give any adequate idea of that suggestion of freedom and strength in the movements of even that bulky looking thing.

Captain Baldwin left the enclosure and sailed over the Aero Club building out into Forest Park. Returning he called out that he would now give a demonstration of the ship's steering capacity and began a series of most convincing turns. The circles he described in the air became closer and closer. No automobile seems equal to such a feat—hardly a bicycle. The blunt shape of the bag is there, of course, of special advantage, just as in warships greater speed is often attained rather by increasing the motive power than by reducing the beam, in order to preserve the good maneuvring qualities.

If Captain Baldwin did not win the race the next day, although his negotiating the very stiff breeze (estimated by Captain Hildebrandt and Professor Rotch as near to 8 meters per second—17.8 miles per hour), looked again extremely creditable, there are two facts which could be named as the reason. His competitors—his own pupils' ships while being copies of his own, were, however, smaller, still using the same engine power, by virtue of the light weight of their operators. The "staying" power of Baldwin's ship was consequently greater, and if the race course had been laid out according to his wishes—as a triangle of great length which had to be gone over several times—it seems most likely that he would have won in the long run.

True to his maxim of showing in public only a perfected, thoroughly reliable

machine, Captain Baldwin had refrained from entering his last creation, still in the experimental stage, though repeatedly and successfully tested in the presence of a number of trusty witnesses in Hammondsport, N. Y. (who signed a joint statement of the facts). It is bigger and has two propellers in front, turning in opposite direction, one close behind the other, by means of a hollow shaft. It was found that their efficiency is thus increased while the strain of the torque on the frame is entirely neutralized. This ship will be remodeled for next season on an ingenious plan. Recent advances in the construction of the giant airships of Europe are for the first time to be embodied in an American craft that will still possess quite as much originality as the first "*Arrow*" had. The proportion of length to diameter will at last be changed and a shape of greater ultimate speed possibilities adopted. To make this, however, a real advantage many new devices had to be introduced, intended to eventually eliminate all possibility of "pitching." They principally consist in an adequate stabilitating surface behind the rear rudder and two sets of superposed aeroplanes or horizontal rudders fore and aft. The ship will be large enough to carry two passengers and the engine strong enough to attain a speed of at least 20 miles an hour. There will also be an improvement on the rudder with the intention of increasing its efficiency to the extent of making this elongated ship turn quite as readily as the sturdy craft of 1903. Twin propellers, mounted as described above, and a specially strong light motor will again be a feature.

It should yet be mentioned, that Captain Baldwin has not only worked out the ships, but all details of their inflating and housing as well—and very efficiently too, with all his previous aeronautical experience. For the new craft a garage or tent, has already been ordered that will stand up without any rope-bracing and be a perfectly rigid structure.

So we may, with good reason, expect great things next season, of that pioneer and "ice-breaker" of the air, the "*California Arrow*."

SPEED OF AMERICAN DIRIGIBLES AT ST. LOUIS.

In the November number we gave an account of the dirigible contest at St. Louis on October 23. Since that time the course has been measured and the speed of the airships is herewith given. This may be of interest to show just exactly what we really have in America.

Operator	Horsepower	Time Min.	Time Secs.	Time per Mile Min.	Time per Mile Secs.	Miles per hour
Baldwin	15	9	30	7	13	8.3
Wild	7	Did not finish				
Dallas	10	8	50	6	42	8.9
Beachey	10	7	15	5	30	10.8
Baldwin, 2d trial	15	Did not finish				
Dallas, 2d trial	10	7	23	5	31	10.6
Baldwin, 3d trial	15	7	05	5	21	11.1
Dallas, 3d trial	10	6	10	4	40	12.7
Beachey, 2d trial	10	4	40	3	33	16.8

It will be remembered that the strong breeze dwindled to practically nothing when the last flight was made. This must be taken into consideration. Captain Baldwin's bag was necessarily larger than any of the others in order to lift the heavier weight of the pilot.

The length of the course, both ways, was 6900 feet, 1.306 mile.

AERONAUTIQUE CLUB DE FRANCE.

M. Sauniere, the president of the Aeronautique Club de France, has succeeded in making a chart of the overhead electric wires in France, which will be of great service to aeronauts, especially at night, in enabling them to avoid landing in places where their guide ropes are likely to touch live wires with currents of 16,000, 20,000 up to 27,000 volts.

NEW AERONAUTIC BOOKS.

DAS LUFTSCHIFF in völkerrechtlicher u. strafrechtlicher Beziehung von Dr. Grünwald, Kriegsgerichsrat b. d. 1. Garde-Division. An interesting pamphlet of 61 pages. Contents: Einleitung—Luft and Meer—Völkerrechtliche Grundsätze für das Meer und die Seeschiffe—Umfang der Anwendung der für das Meer und die Seeschiffe geltended Grundsätze auf das Luftgebiet und die Luftschiffe—Seeschiffe und Luftschiffe—Strafbare Handlungen der Luftschiffer über der hohen See oder staatenlosen Landstrecken—Strafbare Handlungen der Luftschiffer über Staaten, deren Eigen—und Küstengewässern—Einflusz des Interesses des Grundstaates an der Strafverfolgung auf dessen Züstandigkeit—Grundsätze. Published by Helwingsche Verlagsbuchhandlung, Hannover, Germany, price 1 Mk.

COMMUNICATIONS.

We do not hold ourselves responsible for the opinions of our correspondents.

Langley Formula.

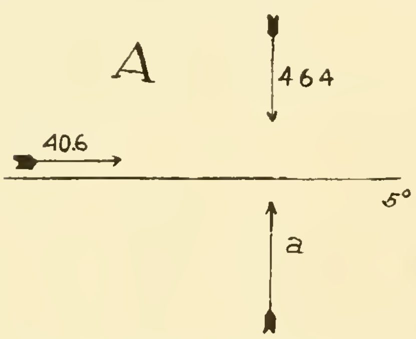
To the Editor:

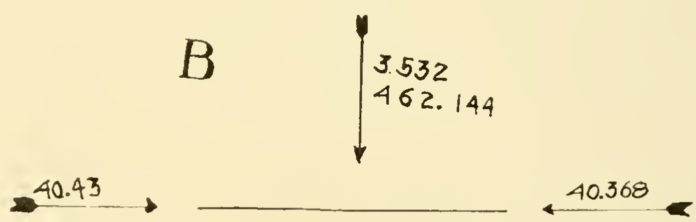
Your correspondent, R. W. S., in the December issue, has trouble with formulas used by Mr. Langley. His experience brings vividly to mind my own along the same lines.

The formulas are all right, as formulas, but they do not apply to the work in hand. All his aeroplanes were surfaces that lie in one direction, and pressure produced by those surfaces must be normal to the surface and such a thing as a component of such pressure is simply nonsense. He assumes weight to be a vertical component, and the tangent derived horizontal force another, at soaring speed. But neither of these forces can make pressure until by resolution they are all made normal to the plane.

Take his 5° diagram as follows, page 37. [Diagram A.]

Pressure is on "a." How can the two oblique forces get on "a" without resolution? If the two oblique forces are components, then "a" is 504.6 grammes, in which case





they would be conspiring forces and not components.

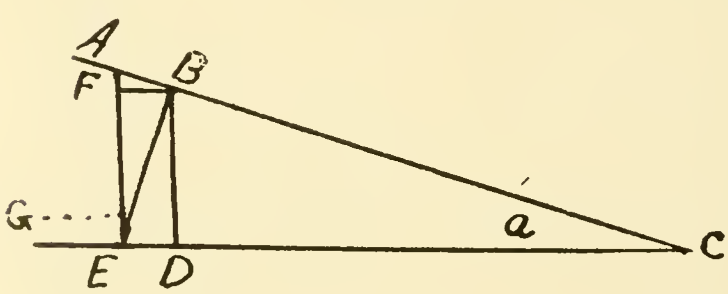
Using the sine and cosine decimals of 5° for multipliers, the diagram becomes the following. [Diagram B].

There would be 465.676 grammes of force making pressure, and .062 grammes pushing the plane on the upward slant; in other words, .062 grammes would be the soaring force.

I could take no interest in Mr. Langley's "paradox." What he insisted was paradox I saw as a plain statement of fact, such as is found in his introductory chapter.

I. Lancaster, Fairhope, Ala.

Verification of Langley Formula.



To the Editor:

Replying to the question of R. W. S. in your December number, on the 36th page, would say: the applied force is along FB and not along the plane ABC. Therefore, FBDE constitutes the parallelogram of forces, EB and not GB the pressure normal to the plane, and DB or EF the upward component of the air pressure. It therefore follows that Pa2 assumed by R.W.S. is greater than the true Pa.

W. R. Kimball.

NOTES.

There seem to be many arguments in favor of a double propeller on dirigibles. Captain Thomas S. Baldwin introduced the idea and made the first flight using a twin propeller at Hammondsport, June 26th, of this year. Following his example, Mr. G. H. Curtiss used the combination when he made his flight on November 27.

"One of the most feted and most Parisian artists, Mlle. Eve Lavallière, has, we are assured, ordered from one balloon builder a dirigible of 2000 cubic meters which she intends to operate herself. It is impossible to be more audacious or more graciously modern."—*La Conquete de l'Air.*

On December 15th the floating shed of the Zeppelin III was torn from its anchorage by a severe storm and the rear was driven on shore, causing the pontoons at the front to sink. Part of the balloon covering was torn away but the machinery and framework was left intact.

A. H. Morgan, of Cleveland, and A. Holland Forbes, of New York, have each purchased from A. Leo Stevens a 40,000 cubic feet balloon.

A. Roy Knabenshue has in his shop at Toledo, being varnished, five balloons of various sizes and three airship bags.

It is stated through press channels that a group of German sportsmen have formed an "airship club" and will order a small American dirigible, in addition to several which will be "made in Germany."

The *Schwabelische Merkur* announces that the German government will demand from the Reichstag a budget of 400,000 marks to permit the Graf von Zeppelin to construct as soon as possible a new dirigible, with a number of modifications (No. 4), in order that trials can commence next Spring. If these trials are conclusive the Government will demand an amount which will add to the budget for 1908, 2,500,000 marks and which is intended for use in purchasing from Graf Zeppelin the proprietorship of his system and to remunerate him for the pecuniary sacrifices he has made during the last ten years.

The misfortune which befell "La Patrie" caused the Queen of Portugal to change her mind about taking a trip in the "Ville de Paris" as arranged.

Referring to the accident to "La Patrie" and the "Nulli Secundus", *The Car* says: "A curiously similar fate seems to have befallen both the British and French military airships. A few days after making her successful trip to London the British airship was destroyed by a storm, prompt action in cutting the gas envelope open preventing the ship from being carried away. "The 'Patrie,' too, after her record run from Paris to Verdun, was also the victim of a storm, and in this case the wind was too violent and the accident too sudden to permit the envelope being deflated."

On November 29, at the invitation of Baron Henri Deutsch de la Meurthe, the Hon. C. S. Rolls and Mr. Frank H. Butler made a trip in the "Ville de Paris", the occasion being their hundredth ascent, around Sartrouville, Maisons Lafitte and Saint Germain. Automotor Journal says: "Mr. Rolls naturally judged his experience by comparison with ballooning, and was struck more particularly by the slight tremor in the framework, and by the curious sensation produced by rushing through the air, the surrounding atmosphere when in a balloon being always quite still, because the balloon travels with the wind and at the same speed. Mr. Rolls was also very much impressed by the complete control which M. Kapferer had over his vessel, and during the hour and a half during which they were in the air they made all sorts of evolutions, sometimes coming down quite close to the ground, and then immediately ascending several hundred feet into the air, by the mere inclination of the horizontal rudders, and without the use of ballast. Subsequently, the Hon. Mrs. Assheton Harbord and Lieut. Frank P. Lahm, who won the Gordon Bennett balloon race in 1906, also made a short trip."

As the new companion dirigibles to "La Patrie" will not be completed until February the French government has accepted the offer of M. Deutsch to send the "Ville de Paris" to Verdun, thus hastening the actual turning over of the latter ship to the government by M. Deutsch.

It is reported that the Reichstag is not as favorable as it was towards the Zeppelin system, the Parseval system claiming the greater number of supporters, and the Graf von Zeppelin went to Berlin to protect his interests.

The first German woman to obtain a pilot's license is Mme. Emmy la Quiante, the wife of 1st Lt. la Quiante of the Berliner V. f. L. She passed through all the trials with success in the presence of a member of the committee as examining pilot.

M. Pelterie, the inventor of the seven-cylinder R.E.P. motor recently illustrated in our columns, asks us to deny the statement that his machine is heavier than other aeroplane motors. As a matter of fact he states that the R.E.P., which is guaranteed to give 30 h.p. and actually gives 35 h.p., weighs 52 kilogs. complete, whereas a well-known 45 h.p. aeroplane motor weighs 73.5 kilogs. complete. M. Pelterie also affirms that his motor will not overheat, and has been run continuously on the bench for over an hour.—*The Car.*

At 35 h.p., the weight per h.p. is 3.26 lbs.

In the course of a lecture delivered by the German aeronaut, Captain Haertel, in Berlin on Tuesday, entitled "The Modern Airship," some new details concerning German aerial navigation were made known. The lecturer, who is in close touch with German military circles and exceedingly well informed, stated that despite rumors to the contrary, the German Government had decided to establish "airship harbors" at Strasburg and Stuttgart and that Count Zeppelin would proceed in his latest airship from Lake Constance by way of those town to Berlin in the early part of next year. The difficulties experienced in landing Count Zeppelin's huge structure of 420 feet in length have been obviated by a special system of buffers, placed beneath the cars.

The new German military airship in the course of construction is to be fitted with stronger propellers and will possess far greater speed. Interesting photographs, taken automatically at a height of 84,624 feet, were shown during the lecture. This altitude is the highest ever attained. The registering apparatus attached to the kites revealed the fact that the temperature of the atmosphere increase after a height of 39,360 feet has been reached.—*Berliner Tageblatt.*

Phil Hinton, the Virginia league catcher, who is in business for the winter at the Williams bowling alleys, says he and Mike Cassidy and a couple of other professional ball players who are spending the winter here, saw a great sight shortly after midnight last night, December 4. It was a huge airship speeding in a southeasterly direction at a terrific rate of speed, which they variously estimated at from sixty to seventy miles an hour.

The men had left the bowling alley and were going to the old Allenhouse, when, at Ninth and Broad streets they heard the sound of a muffled explosion high in the air. Glancing up, they were startled to see a bright, white, incandescent glare, and noticed a cluster of ruby lights outlying the shape of a gigantic airship, of the cigar-shape build, which, in a couple of minutes, so rapidly was it going, vanished from sight to the southeastward.—*News Leader, W. Va.*

Muskogee, Okla., Dec. 19. (Special.) With lights shining on its sides, an airship which looked to be 100 feet long, passed over North Muskogee last night, according to residents in that section. It was going from east to west and remained in view for five minutes.—*Ft. Worth Record.*

Associated Press, Dec. 17. "Jamaica, L. I. was all worked up late last night by the appearance of a huge balloon over the town. It is said that the balloon carried a lighted lantern, suspended from a rope dangling twenty feet below the huge gas bag. This caused even more surprise than the appearance of the airship." Will someone please advise us the brand of dope used?

A new aeronautical journal has made its appearance in London under the direction of J. H. Ledeboer, B.A., and is published as a supplement to "Knowledge and Illustrated Scientific News." The supplement contains "The Practice of Aviation" by Charles and Gabriel Voisin; "Investigation of the Upper Air by means of Balloons and Kites," by W. Mariott, F.R. Met. Soc.; "The Relation of Gliding to Mechanical Flight," by T. O'B. H.; Notes. The main portion of the magazine also contains a short paper on "Practical Aerodynamics and the Theory of Aeroplanes," by Major B. Baden Powell who is also the editor.

Commandant Le Clement de Saint Marco, a Belgian military engineer, has, it is reported, designed an airship which is shortly to be tried out. No details are available.

The English military authorities are preparing maps of the country indicating the "airship harbors," open places in woods, gravel pits and sheltered spots where an airship may quickly land in case of sudden storm while in the air.

Up to the present time hydrogen gas has been made on the ground or furnished by steel cylinders under a compression of 135 atmospheres or 2,025 pounds to the square inch. Six thousand cubic feet of gas including truck cylinders and apparatus weigh about 7,000 pounds.

A new gas producing compound is used known as Hydrolith (Calcium Hydride CaH_2). One hundred pounds of this substance will produce 1,600 cubic feet of hydrogen gas when brought in contact with water. This will greatly facilitate ballooning inasmuch as Hydrolith can be carried as part of the load as well as be transported on land as an inert substance, while the compressed gas in steel cylinders has been looked upon as a source of danger by the military authorities.—*Cement and Eng. News.*

"Balloons and the proper manner of treating them. News that an aeronaut has ridden on the top [?] of our old friend the 'Pommern' from Philadelphia to New York, should enthuse our own red sky-pilot, Max Fleischmann. This one extraordinary performance only proves more sharply how tremendously aeronautics are expanding. Instead of being the humble and somewhat fearful tender of a gas bag, subservient to its whims, the aeronaut is about to make it his servant and instrument. He will not be content to drift along inactive beneath its swelling ribs, but will seat himself on top, if he wills, or clamber and romp over its sides. He may dance hornpipes on it or stand on his head and disport in other acrobatic ways upon its soft and yielding surface. Pillowed on its spongy bosom, he may sleep beneath the stars or bask in the sun rays. When one gets thoroughly familiar with a balloon and has worn off the first awestruck impressions, he will not hesitate to take what liberties he pleases with it. Balloons are not sacred things that one may not use them for punching bags or whatever he wills. A thorough acquaintance with your balloon soon leads you to treat it with much less deference than a stranger or an amateur might. A balloon with which you are on thoroughly good terms ought to afford as much pleasure as a good-natured burro or a baby elephant."—*Cincinnati Herald.*

Looking toward the warfare of the future, German troops have been engaged in target practice, the marks being balloons. Two free balloons released at sea were fired on as they floated landward at Neufahrwasser, West Prussia. One of them was torn by three shrapnel shells and came down. The other floated inland uninjured. A captive balloon, towed within range by a tug, was also brought down.

According to the San Antonio (Tex.) *Express*. "Mr. Ludlow declares that it is perfectly possible to take a number of dirigible airships and tow the ordinary spherical balloons, carrying tons of dynamite, over any desired point and there release these explosives by means of electric wires. 'Absolutely no defence is known to this mode of warfare except by a counter attack by other airships,' he says, and in future wars the destructive forces may be up in the air, instead of on sea or land. Of what use then will be armies and navies?" This may be all right on the lecture platform in Squankum but it will only tend to bear Mr. Ludlow's stock which is now considerably below par.

La Ville de Paris is to make a number of experimental trips in the direction of Rouen, but La République will not be ready for service until May next. M. Lebaudy's Jaune was formerly stationed at Toul, but was later transferred to Chalais Meudon. Recently nothing has been heard of this airship, but now it is stated that it will be ready in a month's time, and after modifications will replace La Patrie at Verdun.

A balloon of the Niederrheinischer V. f. L. escaped in the same way as "Patrie" while being inflated for a race at Muehlberg on December 5.

Count de la Vaulx says he hopes within ten years to undertake to cross the Atlantic in three days in a balloon having a capacity of 6000 cubic feet of gas.—*Press dispatch.*

He would probably then sell it to the Aero Club of America. The French are a thrifty race.

A letter to the editor of the Scientific American has the following comment to make on the utility of aerial navigation:

"While there is a great deal that we do not know about flying machines, in contemplating the future there are at least two predictions that can be made with a high degree of certainty: first, a flying machine will never be able to carry a given weight of paying load a given distance as cheaply as it can be carried on wheels; second, the speed of a flying machine equipped with the same power will never be equal to that of a vehicle on wheels, either rolling over steel rails or a smooth hard road surface.

"The chief obstacle to high speed is the air resistance. By high speed we mean a velocity exceeding sixty miles an hour. This is true no matter whether it is a locomotive on steel rails or an automobile on the wave-swept course on the Florida beach. Since the weight of the flying machine must be supported by an aeroplane or other device, the area of frontage presented to the air must necessarily be much greater than that of a machine on wheels designed so as to offer the minimum air resistance.

"Again, the efficiency of an air propeller can never be made equal to that of the

driving wheels of a locomotive or an automobile; hence the speed of the flying machine will be less on account of the greater resistance and less effective driving power. I am aware that these latter conclusions may be criticised by designers of flying machines, but I would like to know what explanation can be given to show that they are not correct."

Aviator versus aeronaut. Aviators and aeronauts are naturally not in accord with each other and bets are the results of their divergent views. For instance, the most recent is between Mr. P. Y. Alexander and Griffith Brewer. Mr. Alexander claimed that a flying machine can be built for £200 and Mr. Brewer said he would give £500 for one. There is £500 wagered by Mr. Alexander that he will deliver to Mr. Brewer by November, 1908, a machine at a cost of £500.

The "White Book" which is being distributed in the Parliament at Berlin contains an explanation by the Government why it refuses to adhere to the interdiction made by the Conference at Hague in regard to launching projectiles from military balloons or airships. Germany, says this book, is entirely disposed to ratify without delay all the decisions of the Conference with the exception of the declaration relative to balloons. It is to be recalled that the French engineer Juillot has already explained that in war time a vote like this taken by the Conference at Hague would certainly not be observed by the belligerents.

POSTSCRIPT.

Farman Wins Prize.

January 13th. Cable dispatches state that Farman has this day won the $10,000 Deutsch-Archdeacon prize for Kilometre-circuit flight.

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Owing to the desirability for a short and distinctive name, in the future the American Magazine of Aeronautics will be known simply as "AERONAUTICS."

THE AVIATION PRIZE AGAIN.

Few, apparently, are public spirited enough to contribute towards a money prize to be offered to the first aviator who flies a certain moderate distance in the United States. The distance of a mile in a circle has been suggested and seems to be all right, for the present. There is some likelihood of this being accomplished within the year but we are not likely to have a machine to fly five or ten miles "right off the reel." There is little encouragement now being offered for experiments. No commercial value seems to be attached to a flying machine, its sphere being principally for scouting purposes during war or as a sportsman's enjoyment. With little opportunity for gain even if a machine that flies is built, inventors are not going to spend their own money and that of their friends unless they can see a chance of getting it back, at least.

If some one really interested in the sport would hang up a cash prize, inventors would have something in sight as a basis for investment, and on that basis they would be more likely to obtain funds than on the mere drawings with nothing to be gained in case the object is accomplished. From the considerable number of men

who are members of aero clubs, supposedly organized for the sole purpose of aiding in the progress of the art, it would seem that a prize could be secured. After appealing to about eight hundred aero club members a dozen were willing to contribute $25 each towards a $5,000 prize. Unasked, we have received from several nonmembers offers to share in the accumulation of such a prize but it has been impossible to raise the full amount. By keeping everlastingly at it we hope *in time* to complete the amount.

Such a prize would stimulate endeavors to build machines, and while few may be successful in flying, the experience gained will be of value and will eliminate to an extent the promulgation of so many foolish ideas.

Cannot some one be found to contribute the whole amount? There is not a single money prize for aviators in America—in comparison with the $10,000 offered in France by Henri Deutsch de la Meurthe and won by Farman.

AEROSTAT, AERONAT, AERONEF.

The Permanent Aeronautic Commission has adopted the following terms to be used in properly distinguishing between the various types of machines.

Aeronef—Any machine which is without a gas vessel, divided into three classes as follows:

Helicopter—An aeronef which relies on one or more propellers for its suspension and progress through the air.

Aeroplane—An aeronef in which suspension in the air is more particularly assured by one or more planes.

Orthopter—An aeronef which is sustained and propelled by beating wings.

The term aviator is to be employed as defining the operator of an aeronef; aeronaut as applied to the pilot of an aerostat or aeronat.

An aerostat is a balloon, free in the air.

An aeronat is a dirigible balloon.

AERO CLUB OF AMERICA.

There were 41 free balloon ascents made by members in America during 1907, in which 70 members participated, but only 23 different members made these 41. In 10 privately owned balloons 24 trips were made. 9 members own balloons of whom 5 are manufacturers and professionals. 8 members made ascents abroad. 56,000 cubic meters of gas were consumed in the 41 ascents, and a little over 4,600 miles traveled by balloons. One member made 16 flights, three made 9, two made 3, four 2, and thirteen one each. This is a gain of 11 over 1906.

PITTSFIELD AERO CLUB.

The club has leased the grounds known as "Aero Park," adjoining the gas works, and will shortly offer a handsome cup.

AERO CLUB OF FRANCE.

The Club is preparing an aeronautic map of France which will show the various lights, railroads, gas plants where coal gas may be obtained, electric wires, lighthouses, etc., a map which will be of considerable value to the balloonist, especially at night. The map will be published by the well-known French map publisher, Henry Barrere.

During the year 1907, 275,230 cubic meters of gas have been consumed in making 307 flights. 871 passengers have been carried, of whom 111 have been ladies.

AERONAUTIQUE CLUB DE FRANCE.

This organization organizes every year a number of ascensions which cost the members nothing and the ascensions are assigned to members in the order of the receipt of applications. During 1907 thirty of these free ascensions were made, at a cost of $1,800.

NEW AERO CLUBS.

A club has been formed at Lille, France, under the name "Nord-Aviation."

A Dutch society for the promotion of aerial navigation has been started at The Hague.

Silesian society for aeronautics at Breslau.

NEW CLUB IN GERMANY.

A new aero club has been formed under the patronage of the Crown Prince and named the "Deutscher Aero Club E. V." The president is Prince Ernst von Sachsen-Altenburg. Among the members of the Executive Committee are Major Gross, the commander of the aeronautic battalion, Major von Parseval, General Consul Schwabach. The membership is divided into honorary, life, regular, associate and lady.

GORDON BENNETT, 1908.

The race has been set for October 18 at Tegel, near Berlin. This date falls on the last quarter of the moon. Unofficial reports state that America, Germany, France, Italy, Spain and England have entered three balloons each; Switzerland two and Sweden one, twenty-one in all. The contestants must be named not later than July 20. France is receiving applications to act as representatives up to the 30th of April. The Aero Club of America is inviting applicants who must each furnish a new balloon.

NEW AERO PRIZES.

The North Adams *Herald* has offered two cups of the value of $100 each: one to the aeronaut starting from North Adams and landing within five miles of Boston Common; one to the aeronaut who shall first make a flight of 100 miles in a straight line from North Adams, the prize to be retained by the first man to make that distance until someone else exceeds his mileage and the cup is to become the permanent property of the aeronaut making the longest continuous journey from North Adams during the calendar year 1908.

Anderson & Price, proprietors of the hotels Mount Washington and Mount Pleasant at Bretton Woods, N. H., offer a cup of the value of $100 to the aeronaut starting 150 miles away who makes a landing within 1 mile of either of the two hotels.

M. Armengaud Jeune has offered a prize of $2,000 to the owner of the first aviator who shall remain in the air fifteen minutes.

The Aero Club of Belgium has decided to offer a prize of $100 to the Belgian schoolmaster who shall draw up the best popular textbook on aeronautics. The idea of the competition is to induce the young minds to take an interest in the problem of aerial navigation.

Dr. Ganz, president of the ballooning section of the Bavarian Automobile club, has offered a prize of $2,500 for an aeroplane race, distance not mentioned, to take place during the Munich exposition next summer. Dr. Ganz hopes thus to induce German inventors to turn their attention to the aeroplane.

Albert C. Triaca has offered a prize of $100 for the longest flight in 1908 made by a member of the Aero Club of France or the Aero Club of America.

Three of the many prizes now offered have now been won. Santos Dumont won the Archdeacon Cup by a flight of 25 meters and Henry Farman won the Grand Prix d'Aviation (popularly known as the Deutsch-Archdeacon prize) of $10,000 and at the same time the Daily Mail prize of $500.

The cups now offered in this country are as follows:

Lahm Cup, value $1,100, to the aeronaut beating Captain Chandler's—the present holder—record of 475 miles.

Boston Herald Cup, $100 value, to the aeronaut starting 100 miles from Boston and landing within 5 miles of Boston Common.

Poland Spring Cup, $100 value, to the aeronaut starting 150 miles from Poland Spring who lands his balloon within 2 miles of that place.

North Adams Herald Cup, $100 value, to the aeronaut starting from North Adams and landing within 5 miles of Boston Common.

North Adams Herald Cup, value $100, to the aeronaut making a flight of 100 miles starting from North Adams.

Bretton Woods Cup, value $100, to the aeronaut landing within 1 mile of the hotels Mt. Washington or Mt. Pleasant at Bretton Woods, start to be made 150 miles away.

Scientific American Trophy, value $2,500, for dynamic flight of 1 kilometer.

BALLOON RACE AT VERONA.

Under the patronage of the municipality of Verona, M. Bellini-Carnesali, the mayor, has nominated a committee to arrange the event.

The committee has prepared a program for a distance race to be held March 19, the balloons to start from the center of the old amphitheater constructed by the Romans in the 16th century. The rules are similar to those for the Gordon Bennett, except that the limit of size is 1000 cubic meters. The entry fee is $20, with the gas free. The Aeronautic Cup of Verona is offered as the main prize. Four gold medals will be given to the four making the next longest distances, while a silver plaque is offered to the chauffeur of the automobile that shall arrive first at the landing of the winning balloon.

AERONAUTICS IN GREAT BRITAIN.

(By Our London Correspondent.)

In this, the slack season of ballooning, little beyond the ordinary balloon ascents, which take place from London almost every day is to be recorded in the matter of aerostation. As far as can be foreseen at the present time, however, the forthcoming season promises to be a memorable one. Several balloon races have been organized for the summer; these will take place from the grounds of Hurlingham Club, where a complete system of gas-conduits is now being laid down. An international balloon race will start from there towards the end of May, on the occasion of the fourth meeting of the International Aeronautical Federation, which will be held in London.

The construction of the new military dirigible is progressing satisfactorily at Aldershot. No precise details can, of course, be obtained; but it is understood that a new section is to be added to the gold-beater's skin envelope, which will be some 5 yards longer than the former one, and that far-reaching improvements are being made in the car, in the various steering devices, and in the apparatus for maintaining the airship's stability. The motive power will also be greatly increased—a new 100 h.p. Antoinette engine taking the place of the old one.

With regard to the experiments conducted by the military authorities in Scotland last summer, under the superintendence of Mr. Dunn, complete secrecy is maintained. However, this much can be said: although the machine was never actually tried in flight, satisfactory results were obtained. It is believed that the principle of the "rotary plane" (referred to by Professor Köppen in the article on parachutes in the "Pocket Book of Aeronautics") has formed the basis for some experiments.

At the moment of writing, no trials with man-carrying flying machines have been made in this country—at least in public. Two aeroplanes are, however, completed both of which will be tried during the next few weeks on the Brooklands Motor Racing-Track. The first, constructed by Mr. A. V. Roe, one of whose models gained the second prize in the competition last April, is already housed in its shed on the track. This aeroplane has two main super-posed planes, 36 ft. long by 5 ft. in depth; the upper one being situated 5 ft. above the lower. The forward steering plane is 28 ft. by 5 ft. The framework is constructed of bamboo and thin ash uprights, the covering being air-proof canvas. The steering is effected by twisting the planes by means of wires running over the central steering wheel. The motive power consists of a two-cylinder, 8 h.p., J. A. P. motor, actuating a 6 ft. 6-bladed propeller at an estimated speed of 1800 r.p.m. It is difficult to believe that this machine will ever rise from the ground with this inadequate power; little more than ordinary glides can be expected to result.

The second aeroplane, which, as far as can be judged at present, offers far greater prospects of success, has been designed and constructed by Mr. J. T. C. Moore-Brabazon, a well-known member of the Aero Club. This aeroplane is also of the double-deck type. The frame of bamboo and ash, is covered with varnished balloon fabric up-and-down steering is effected by a front plane, horizontal steering by a special apparatus designed by the inventor. In addition a new device for maintaining equilibrium is expected to give good results. The aeroplane is mounted on long ski-like runners, which should to a great extent, preserve it from serious damage in landing.

The whole machine is mounted on a broad launching carriage, (running on four light wheels) from which it is released as soon as it has attained sufficient speed on the ground and the requisite upward lift. The absence of wheels on the actual aeroplane is a distinct advantage in point of weight and practicability, which should be obvious to any one who has closely followed the aeroplane experiments in France, where in the case of nearly every aeroplane, landings have almost invariably resulted in buckled wheels, which have necessitated repair and have thus interrupted experiments in a most vexatious manner.

The motive power consists of a 24 h.p. eight-cylinder Buchet motor, weighing 120 lbs., and driving a large four-bladed aluminum and steel propeller. The blades are spoon-shaped, not unlike those of Santos-Dumont's propeller. The machine will be tried by its inventor at Brooklands within the next month.

Another machine, details of which are not available, is being constructed here by Mr. Howard Wright to the designs of an Italian engineer, and will shortly be tried in this country. In conclusion it may be mentioned that Mr. Wright has just purchased two 5-cylinder Esnault-Pelterie motors.

In addition experiments are being conducted privately by several persons. In one case at least, there should be some prospect of a project materializing before the end of the year. Shortly after his return from America, Mr. Griffith Brewer, at one of the monthly Aero Club dinners, expressed his doubts as to the practicability of the flying machine in its present stage of development. The challenge was promptly taken up by Mr. Patrick Y. Alexander, who wagered £500 that within a year he would construct a machine which would fly a mile. The bet was as promptly accepted by Mr. Brewer; and there should be no doubt that an enthusiast of Mr. Alexander's wide reputation will not forfeit the stake without a serious attempt to accomplish the per-

formance. Unkind rumor even whispers that since the bet became known Mr. Alexander has been inundated with applications from foreign firms of constructors to build him an efficient machine within the stated time.

PARIS LETTER.

The first of the year saw Farman, Delagrange, Pischoff and Santos Dumont all waiting for a let-up in the wind and frosty weather to begin practice with their aeroplanes. The "Antoinette" aeroplane designed by Captain Ferber has been completed, and is being equipped with a 100-horsepower Antoinette engine. Santos Dumont has modified the "No. 19," and it now has two propellers driven by belts from a 2-cylinder horizontal engine of 8 horsepower. On December 31 Bleriot started practicing with his aeroplane, "Libellule," but the machine was not quite ready and the aviator had to content himself with runs on the ground and short distances at a slight height. The Republique, the new French military dirigible under construction at the shop of Lebaudy Brothers at Moisson, will probably be delivered the first part of May. Two others provided for in the 1908 budget will also be put in the air later on under the direction of the engineer, Juilliot. It is reported that the plans for the fourth dirigible have been approved by the Lebaudys. This one will be three times the capacity of those built to date. The bag will contain about 10,000 cubic metres and the motor will be 150-200 horsepower.

Referring to the *Berliner Neueste Nachrichten*, the Imperial German Government will ask for a trial for the Zeppelin III before they turn over to the Graf von Zeppelin the subsidy of 2,150,000 marks voted him in the Reichstag. The balloon will have to accomplish a distance of about 700 kilometres and remain in the air uninterruptedly for 24 hours.

On January 2, the generals assembled at Berlin to pay their respects to the Emperor were given opportunity to make flights in the German military dirigible, at Tegel. With Prince Ruprecht of Bavaria in the car the first flight lasted 39 minutes, permitting the balloon to make several evolutions above the manoeuvring ground. In the second flight with three generals aboard the weight was too great and the balloon did not rise with sufficient speed and hit a wall. One of the generals got out and the ascension took place. A journal states that this ascent attempted in public "without having taken necessary precautions, shows that the German military corps were not used to manoeuvring their balloon."

Farman is taking a rest after his prize flight, but will soon start work on a new aeroplane, "No. 2," of the Langley type.

Dec. 24—The Ville de Paris started for Verdun to take the place of the lost La Patrie. A strong wind was encountered, against which the ship was able to make 17 kilometres an hour. However, finding that it would be impossible to make Verdun that day, the pilot, Kapferer, turned back home. The trip made was of about 130 kilometres.

Dec. 30—Farman flew a kilometre in a circle, but the flight was not perfect enough to win the Deutsch prize.

Jan. 4—Twice in succession at the Issy-les-Moulineaux parade ground Farman succeeded in flying a circular kilometre with his aeroplane, and besides proving his ability to win with comparative ease the coveted Deutsch-Archdeacon prize, he also established a record for the longest flight yet made in Europe, with an apparatus of the gasless type. Had the celebrated aviator convoked the Aero Club officials the $10,000 prize would now be his property, but until a few minutes beforehand Farman had no intention of making a lengthy flight. There had been a treacherous wind blowing all the morning, and it was not until somewhat late in the afternoon that the machine was brought out of its shed and put through several short flights. In spite of the bad surface of the ground, making starting difficult, the motor seemed to be working so well that he decided to make a longer flight, and rising gracefully into the air from one corner of the field a vast curve was described, which terminated within three or four feet of the starting point. A second attempt was made, and practically the same ground was covered with an ease which astonished the none too numerous spectators. The machine answered its helm perfectly, and covered the distance, estimated as one mile, in 1¾ minutes, taking the curve just as if it were an automobile.

Jan. 6—Farman and Pischoff practiced, and Farman made two short flights in the heavy wind. The wind struck the machine and forced it to the ground heavily, but did no damage.

Jan. 12—Farman made two very successful flights at Issy, and convoked the Aviation Committee of the Aero Club de France for the following morning in order to officially compete for the Deutsch-Archdeacon prize.

Jan. 13—Farman flew around the kilometre course and won the Grand Prix de l'Aviation, $10,000, together with the Daily Mail prize of $500 for a circular flight of half a mile, and a gold medal from the Aero Club of France. The Antoinette motor won the

gold medal offered by Albert C. Triaca of the Aero Club of America to the manufacturer of the motor carried in the machine winning the Grand Prix, and Voisin Brothers, the makers of the machine, received a silver medal from the Aero Club de France.

Jan. 15—The Ville de Paris traveled from Paris to Verdun, the place from which La Patrie blew away, 155.34 miles in 8 hours 18 minutes. Average speed per hour, 18.71 miles. A short stop was made at Valmy to make a few adjustments, the time being deducted in the above figure. The total duration was 9½ hours.

Farman covered more than two kilometres in a three-minute flight.

In the first trial an endeavor was made to rise in the air with a load of thirty kilos. It was found that the charge was too great. Only a very slight lifting movement could be obtained. With twenty kilos weight the machine rose for the length of a few hundred metres, but it possessed no "life."

With fifteen kilos a very successful flight was made from the shed to the fortifications, where by reason of a sudden, strong gust of wind M. Farman was obliged to turn almost at right angles. The machine responded wonderfully, though it took an inclination which for a moment was distinctly dangerous. A few seconds later a curve had been accomplished, and then the apparatus, on an even keel, sped to the far corner of the field, never more than a metre or a metre and a half from the ground.

For the final test it was decided to remove all the added weight and make a long run with the apparatus, just as it was when the Grand Prix was won, three days before. Starting close to the shooting range, the machine shot into the air fifty yards further along. Passing by the Porte de Sevres, M. Farman skirted the fortifications in a vast circular movement, covering more than two kilometres and remaining in the air nearly three minutes. He descended just before the door of the shed.

M. Farman was almost as much pleased with this flight as with that of Monday. He had stopped longer in the air than in any previous flight, and had covered a longer distance.

Speaking with a *Herald* correspondent, M. Farman said he was much pleased with the trials, because he has now firmly satisfied himself that he has been running all the time just on the power limit, and that he has nothing to spare. The work of dismantling the apparatus for a thorough overhauling will be commenced at once.

Jan. 17—Delagrange made first trial of his "No. 2."

Jan. 18—Ville de Paris made a sortie lasting an hour with four people aboard, at Verdun.

Jan. 20—Delagrange made over 100 metres at an altitude of 3 meters. Gastambide and Mengin made 10 runs along the field at Bagatelle at the rate of 40 km. an hour. It is estimated a speed of 55 km. is necessary to get the machine in the air.

AERONAUTIC CALENDAR.

February 16-23. Distance and landing races of Aero Club Sud-Ouest, Bordeaux.

March. Balloon race organized by the Aero Club of Nice. Distance race at Verona, Italy, on the 19th.

April 15. Balloon race at Paris organized by the Aero Club of France.

May. International balloon race in England organized by the Aero Club of the United Kingdom. International Aeronautic Congress at London. Balloon race of the Aero Club of France.

July. Balloon race organized by the Aero Clubs de Brussels, Bordeaux and Tourcoing. Dirigible contests at Bretton Woods, N. H.

September. Grand Prix of the Aero Club of France at the Tuileries.

October 18. Gordon Bennett International Race, Berlin.

1908. Aeroplane contests with and without motor, at Munich Exposition. No date settled.

1911. International assembly of dirigibles in Italy, under the auspices of the Societa Aeronautica Italiana.

TOMMY.—"I say, pa, what ——"

FATHER.—"Ask your mother."

TOMMY.—Well, it isn't a silly question I want to ask you."

FATHER (wearily.)—"All right, what is it?"

TOMMY.—"Well, if the end of the world was to come, and the earth was destroyed while a man was up in an air ship, where would he land when he came down."

FARMAN WINS THE GRAND PRIX.

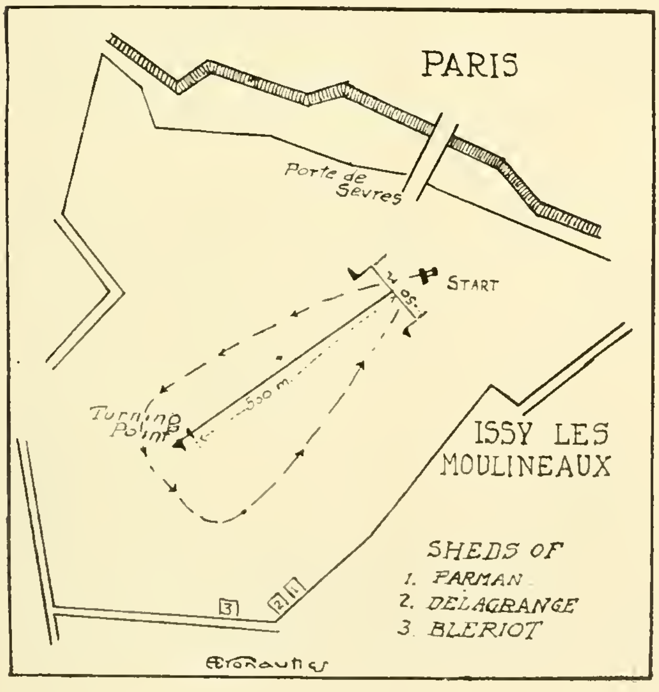
On January 13th—note the day—the third man in the history of the world was able to fly in a dynamic flying machine a distance of over 1 kilometre, Orville and Wilbur Wright being the other two. America is a little over four years ahead of the rest of the world, for the brothers Wright made their first flight for a distance of 852 ft. in a motor machine on December 17, 1903. In 1904 they increased the flights to a mile and more, and on October 5, 1905, made the record flight of over 24 miles in 38 minutes with their second motor aeroplane. Of course, many changes had been made during the two intervening years. The foreign journals state that the flight of Henry Farman was the longest ever made in a gasless machine. We Americans do not want to forget that we are entitled to some credit in the matter, even though we have done little to aid progress in the art here, and the results accomplished have been rather in spite of aero clubs than with their support.

All credit and honor, too, to Henry Farman, who perhaps has done more, through publicity, to brush away the cobwebs of doubt and ridicule than have the Wrights. Surprising it is, but a fact, that even here we doubt that the Wrights ever flew, while we read of the flights of Farman with less astonishment than at the cultivation of a seedless apple or the invention of a headacheless booze.

After a couple of test flights on Sunday, January 12th, Farman felt confident in asking for the committee of the Aero Club of France to attend the following morning; the fifth official contest for the Grand Prix.

There was scarcely any wind, and the sun shone, brightening up the surroundings in honor of the event. At 10 o'clock the flags marking the course were placed in position, and at 10:12 the great machine started for the flag. After a preliminary run of a hundred yards the machine rose gracefully into the air and sailed like an enormous bird down the course. Half way to the 500-metre post the machine was tilted up a little to a height of about 8 metres. The turn was safely made, and after a wide curve the home stretch was negotiated.

Sweeping past the finish line at 4 metres from the ground the prize was won. Europe had seen at least that what the Wrights had claimed to have done might easily be *possible*, if not *probable* in their minds.



The time was 1 minute 28 seconds for the round trip. Considerably more than a kilometre was covered, as will be seen from the diagram.

The machine landed easily almost at the feet of the committee. M. Deutsch de la Meurthe, with M. Archdeacon, the donors of the prize, stepped forward and embraced the winner. "I congratulate you, my dear friend, on the great success which has crowned your perseverance and your energy. I am happy that with my own eyes I have seen solved the two problems which were closest to my heart: man guiding himself through space by machines both heavier and lighter than air. What will follow is now only a question of development until aerial navigation shall be within the reach of all. From to-day I shall hold you in grateful memory for having secured to me the profound joy of realizing my most cherished dream," were the words addressed by M. Deutsch to Farman. Other men paid their tribute to the man who, by his dauntless energy, carried the aeroplane from being held a myth to a practical means of locomotion.

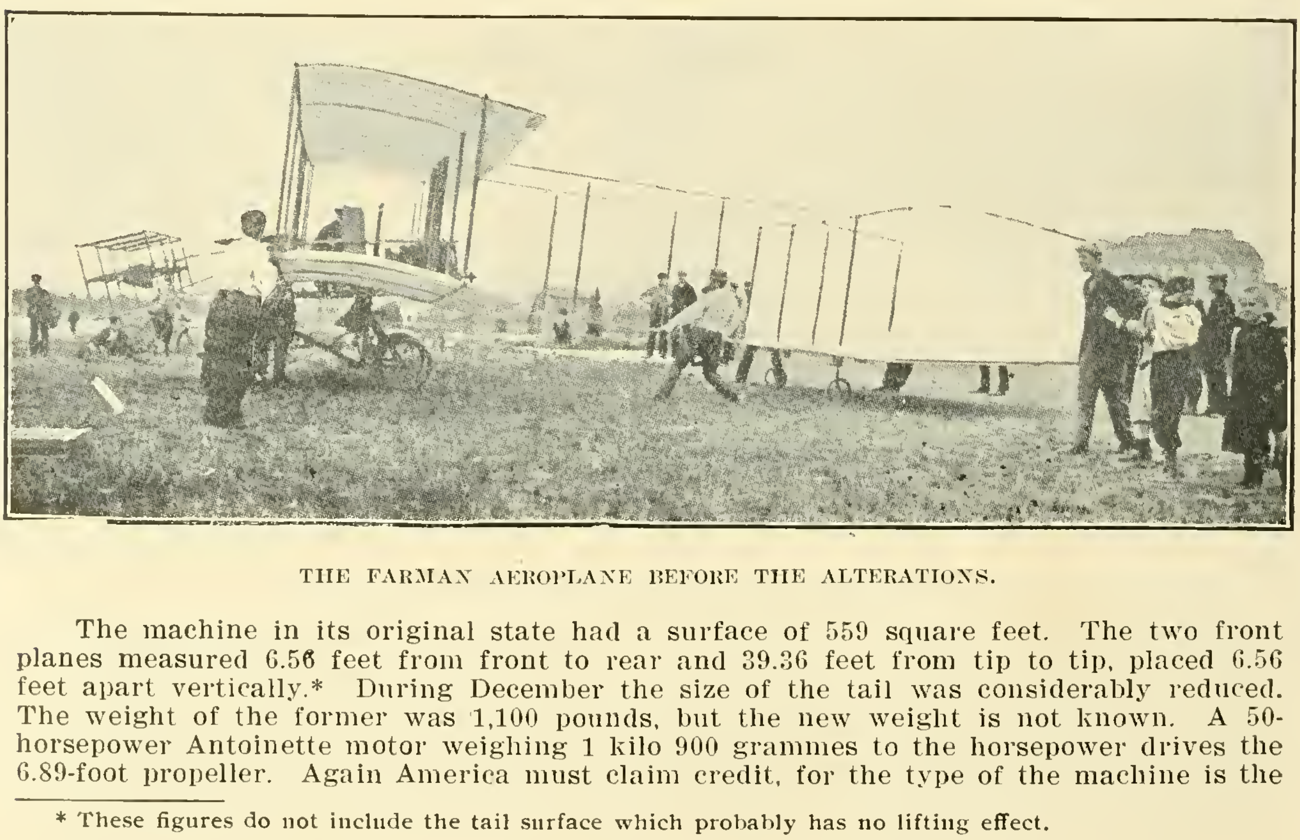
After the flight Farman stated: "Of course, I am very satisfied with to-day's achievement, but I think it is only the beginning. I am full of confidence in the future. The aeroplane has come to stay. In a few years it will be a practical, reliable means of transportation. For the moment I am going to rest a little. Then, if I find that the conditions controlling the prizes in England and elsewhere are reasonable, I shall probably go and try for them. In any case, I shall have my new machine in a month's time—a lighter, faster and, I hope, more reliable apparatus than this one. Whether new prizes are offered or not, I shall go on with the sport, because I have now got thoroughly inter-

ested in it. With my new machine, or with others yet to be built, I think long trips will be possible. There is only one thing at present which worries me, and that is the insecurity arising from the propeller. It might happen that a propeller broke when the machine was at a great height from the ground. That would, perhaps, mean a serious fall. But we shall get over that difficulty. The new propellers in view are stronger than any we have yet tried. We shall learn more how to control them. When we have

Scientific American Photo

Farman in full flight about to cross the finish line in the Deutsch-Archdeacon-kilometre-circle competition, thus winning the Grand Prix d'Aviation, $10,000. Reading from left to right: Rene Demanest, Andre Fournier, Louis Bleriot and Charles Voisin, one of the two Voisin brothers who built the machine. In the automobile is M. Archdeacon, one of the two donors of the prize and Mme Archdeacon.

done this there is no reason why, in reasonable weather, lengthy trips should not be accomplished with ease." "Flying is like walking," Farman explains. "I dash up diagonally into the air with all my present motor force; but at the slightest slowing of the motor, or at an untoward shifting of my body, the down dip begins and I go tobogganing down upon the air. Before I get too low I must put my advance spur on the motor, raise the lifting rudder and turn the down dip into an upcurving dash."



THE FARMAN AEROPLANE BEFORE THE ALTERATIONS.

The machine in its original state had a surface of 559 square feet. The two front planes measured 6.56 feet from front to rear and 39.36 feet from tip to tip, placed 6.56 feet apart vertically.* During December the size of the tail was considerably reduced. The weight of the former was 1,100 pounds, but the new weight is not known. A 50-horsepower Antoinette motor weighing 1 kilo 900 grammes to the horsepower drives the 6.89-foot propeller. Again America must claim credit, for the type of the machine is the

* These figures do not include the tail surface which probably has no lifting effect.

one first designed by Messrs. Herring and Chanute, used by the Wright Brothers, and copied in the Farman, Pischoff, Archdeacon, Ferber, and other machines.

Henry Farman, an Englishman by descent, was born in Paris in 1873, and has lived the greater part of his life in France. He is one of three sons of T. Farman, a newspaper correspondent of some note.

Previous Records.

On October 22 last Farman made a flight of considerably more than 100 meters (about 110 yards). The machine rose from the ground almost instantly, and the propeller was set in motion, although there was no wind.

The way the aeroplane left the ground in this test proved to the aeronaut's satisfaction the correctness of his theory that a great improvement in the effective force of the propellers could be obtained by increasing the diameter and reducing the pitch.

Again, the following day the aeronaut made half a dozen successful flights, further demonstrating that the propeller of enlarged diameter had given the heavier-than-air machine additional lifting power. The great steadiness of Farman's aeroplane was a feature of the demonstration.

All records for heavier-than-air machine flights were finally broken by the aeronaut on October 26, when Farman drove his aeroplane 771 meters (about 800 yards) in fifty-three seconds, at the height of about three meters. Earlier in the same day he had covered 363 meters in thirty seconds, breaking the record of 220 meters held by Santos-Dumont.

Continuing to make almost daily trials, Mr. Farman, on November 7, twice beat his own record of 771 meters, made the previous month. His longest measured flight was 800 meters, but his second flight, which was not measured, was 100 meters longer. He remained in the air one minute and ten seconds. He also scored a further advance with his machine by performing on his third trial a huge "S" in the air with perfect stability.

UNDER FIRE IN A WAR BALLOON AT SANTIAGO.

By Ivy Baldwin.

[The captive balloon used in the battle of Santiago was constructed and operated by Ivy Baldwin and his experience is related here for the first time.—Ed.]

Embarking at Port Tampa, Florida, on the 14th of June, 1898, with the first expedition of invasion to Cuba under command of Major General Shafter, we landed at Baiquiri on June 22nd and went immediately to the front in small detachments, handling all cable and telegraph lines on which was transmitted all information from the seat of campaign.

The troop (Company "B," Signal and Balloon Sections) constructed a field telegraph line to the front and connected the American trenches in front of Santiago through the cable with the United States.

Three ascents with the balloon at a safe distance on June 30th, were made adding to a knowledge of streams, trails and roads in front of our army, and disclosing clearly the mooted presence of Cervera's squadron in Santiago Harbor. On the flattering report and the recommendation of his chief engineer, General Shafter decided to use the balloon in battle next day, and ordered it to be brought to El Poso.

At daybreak on July 1, Major Maxfield rode in advance to El Poso Hill, the position designated by orders, only to find it vacant and covered by a sharp shrapnel fire, and to have his horse shot from under him. The balloon was then put up about a quarter of a mile in rear of the base of the hill, with Major Maxfield, Colonel Derby and Sergeant Ivy Baldwin in the basket, being within easy artillery range of the enemy. From this point the movements of the troops at El Caney and on the road in front towards San Juan Hill were clearly visible, and were made known at once to General Shafter's chief of the staff. Colonel Derby then ordered the balloon forward to the advance line, although Major Maxfield stated that artillery experiments abroad clearly demonstrated that a balloon could not live in such position. The orders were immediately obeyed, and the balloon was put promptly in the air in front of the troops deploying for the assault on San Juan Hill. Observations thus made were of great value. The commanding general was immediately informed that the intrenchments on San Juan Hill were strongly held, and the suggestion that Grimes' artillery on El Poso immediately open fire was followed. There was also discovered a trail, hitherto unknown, leading to the left to a ford on the Aguadores. The discovery of this way was communicated to General Kent, who promptly availed himself of the information to relieve the congested condition of the main road by diverting therein part of General Hawkins' command. This action enabled the deployment of our troops over two roads, and by doubling the force may possibly have been the determining factor in the gallant capture of San Juan Hill.

The balloon was directly in front of General Kent's division, and its appearance in the air was the signal for a very heavy and accurate fire of musketry and shrapnel, resulting in such numerous casualties that the men gave the place the name of "Hell's Corner" and "Bloody Ford." The balloon was punctured in thirteen places by shrapnels.

MEMORANDUM ON THE SANTIAGO CAPTIVE BALLOON.

By Lieut. Col. Wm. A. Glassford.

Ivy Baldwin, aeronaut, holds about the same place in the Spanish War that Lowe and La Montain as aeronauts do to the Civil War. Baldwin was, however, a part of the army; Lowe and La Montain were civilians.

The army balloon park established at Fort Logan, Colorado, a short time before the Spanish War, needed just such a practical and resourceful aeronaut as Baldwin to help in the improvisations made necessary, and to give confidence to the men being instructed there. He was invaluable in teaching the details of manipulation, also construction of balloons and their accessories.

The gold-beaters' skin balloon "General Myer" manufactured in Paris at the Lachambre factory in 1892 for exhibition at the Columbian Exposition in Chicago, was later transferred to Fort Logan, Colorado, near Denver, because the atmospheric conditions upon the foothills of the Rocky Mountains were so highly favorable.

An apparatus for generating hydrogen was here constructed, and a compressor for impounding hydrogen gas installed. These were assembled about the Fort Logan pumping station so as to obtain water for decomposition into gas, and power from the pumping engine to force the gas through the compressor into the storage tubes.

There was no house in which to place the balloon when inflated, and so a shelter was improvised out of bales of hay or straw arranged as a wall on three sides of a square, and high enough to protect the inflated balloon from ordinary wind. However, such protection was not always sufficient, and the General Myer while full of gas was ruptured in a wind storm and became a total loss. Under such difficult circumstances and inadequate provisions was the first aeronautical work in the army commenced. An incidental visit of the Secretary of War, accompanied by his secretary (now Major General Davis) who saw these improvisations, was responsible for the erection of a good balloon house, and allowances of the means to go forward with the development of the plant.

In all these difficulties the aid of the Army was ever to be depended upon. General McCook, the department commander, provided a detail of enlisted men selected from various army posts under him, also the widest of space for balloon maneuvres upon the reservation at Fort Logan. Colonel Merriam, its commander, aided in every possible detail, while the officers and men always evinced an interest and were on the alert to help in any way they could.

With space for work a balloon house, balloons, generator, compressor and accessories, also aid from the authorities, considerable of an aeronautical park was assembled at Fort Logan. The formation of a balloon train was accomplished, using the ordinary army wagons, except the captive balloon wagon which was a specially constructed vehicle.

Several balloons were made; exercises with them held by cable as captives carried on. In all this work Baldwin was invaluable for he knew the practical details of every part of the work from cutting the gores of a balloon envelope, making the netting, inflation, and in all ascensions he was in the basket. His presence gave confidence to the men for they felt assured if any thing should happen to free the balloon they would be safe with so experienced and practical an aeronaut to pilot the balloon in its flight and landing. Baldwin was free from that disposition to keep to himself the knowledge that he had derived from a long experience as an aeronaut. He never failed to answer any question asked him. He deserves much credit, for it is certain that what was accomplished with the balloon at the siege of Santiago de Cuba had its genesis with Ivy Baldwin.

The names of the men in Baldwin's Company are most of them familiar as those of the detail at Fort Logan. The training they secured there prepared them for handling the balloon in battle under the trying circumstances which are apparent when the envelope was punctured in so many places.

THE MILITARY VALUE OF BALLOONS.

By 1st Lieut. George A. Wieczorek, Signal Corps, U. S. A.; Instructor, Army Signal School.

Many conservative military men look upon the balloon as somewhat of an encumbrance to an army in the field. They always think of it as a big ungainly instrument, difficult to manage and therefore requiring a large personnel and many wagons to haul the apparatus that goes with it. Its appearance when ready for ascension would indicate this, but on closer accquaintance it is sure to be found a most valuable adjunct.

At present, I believe, the balloon is most valuable to us in reconnaissance. As an instrument of offence or defence it is a doubtful factor. We can see, however, that

there is some hope for the evolution of an offensive factor, provided that in its present state it comes into more general military use. Modern firearms were developed to their present high state of perfection by constant military use and frequent improvement. Balloons will undergo a corresponding development.

Briefly, the military uses for the different classes of balloons are:

(a) *Captive* balloons; reconnaissance of a limited front as the front of a division or army corps previous to an attack on an enemy's position or when it is occupying a defensive position awaiting attack.

(b) *Free* balloons; entering or leaving besieged places under favorable conditions. The recent contests in this country have shown us that we can depend on free balloons to make flights of from 700 to 800 miles under favorable conditions. If we wished to enter or leave a besieged place with important messages, favorable conditions for bal-

U. S. INFANTRY AND CAVALRY SCHOOL, U. S. SIGNAL SCHOOL AND STAFF COLLEGE.

looning would be of no value to us without a balloon, but at that moment, *if we had the balloon*, it would be worth many times its weight in gold.

(c) *Dirigible* balloons; reconnaissance of an extended front like that of an army in position before a battle.

The adoption of high power firearms which kill at extreme ranges has led armies to adopt formations which cause their troops to be extended along fronts sometimes fifty miles long. It is apparent even to a non-military observer that a reconnaissance of such a large piece of territory would consume much time. As this factor enters so vitally into all military calculations, the value of a dirigible balloon for this important work can not be measured in dollars and cents.

Our army has been anxious for some time to take up the subject of military aeronautics and we have now made a very favorable start. The recent international contests in St. Louis have given the science of aeronautics and aerostatics an impetus that is bound to be evident in a short while. Inventors all over the country are putting forth their best efforts and I hope that our government will be able to give some of them the aid that their efforts deserve, in the near future.

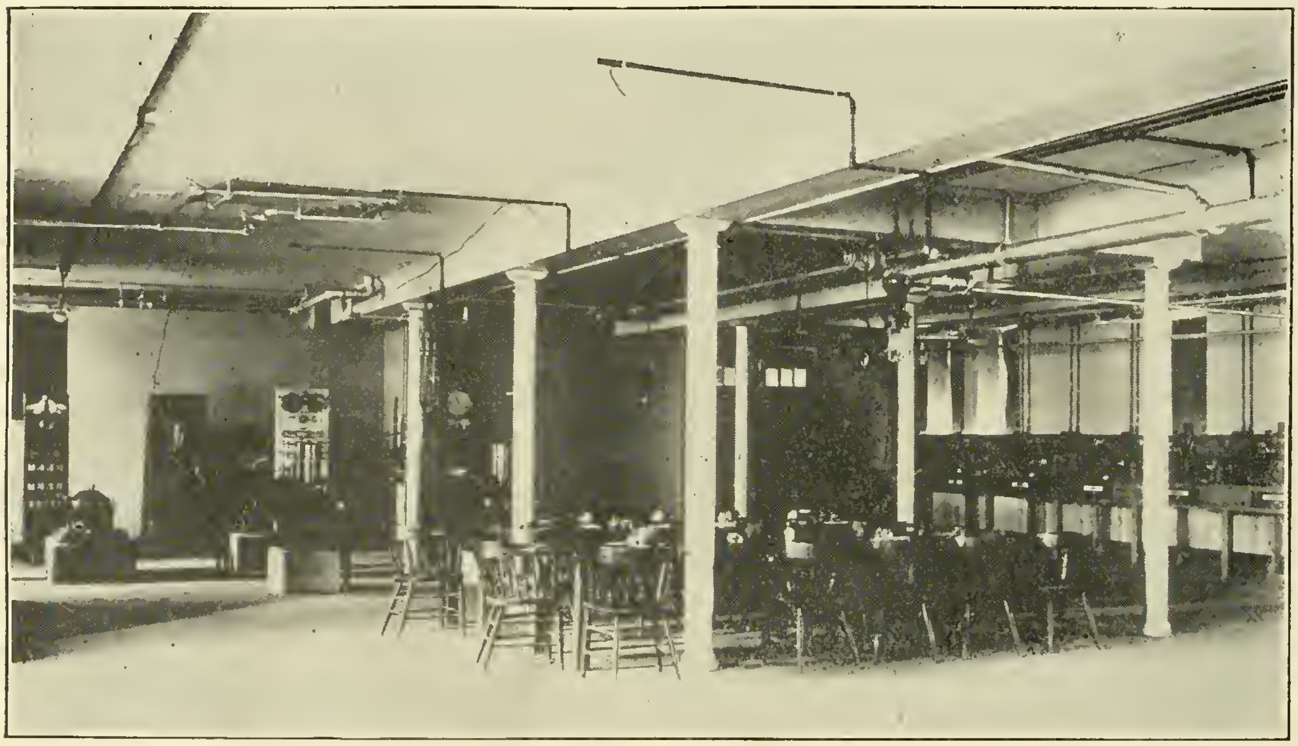
In the army we have already established the Army Signal School at Fort Leavenworth, Kansas, where officers of the Signal Corps as well as line officers, receive instruc-

tion in all branches of science that pertain to the transmission of information to every part of an army in the field. Militia officers of State Signal Corps organizations are also permitted to attend this school by making application to the Adjutant General of the Army.

A course of theoretical instruction in balloons and air machines forms part of the work in the Department of Signal Engineering at the school. At present the course is necessarily confined to a series of lectures and conferences at which the possibilities of the use of different classes of balloons are discussed.

At Fort Omaha, Nebraska, the army is building a large balloon shed and a hydrogen generating plant. It is hoped that by next spring it will be possible to supplement the present course in aeronautics at the Signal School with ascensions of both free and dirigible balloons. The country in the neighborhood is admirably adapted to making short ascensions as there are few trees and many railroads.

Among the other subjects taught at the Army Signal School, are the following:



A CORNER IN THE LABORATORY OF THE ARMY SIGNAL SCHOOL.

1. Department of *Field Signaling;* Use of optical, acoustical and electrical signaling apparatus, buzzer, field wireless telegraph and field telephone.
2. Department of *Signal Engineering;* Electricity (practical and theoretical), telephony, operation and installation of steam, gas and oil engines, construction and operation of permanent wireless stations, installation and repair of submarine cables and logistics of Signal Corps troops.
3. Department of *Topography;* Rapid sketching, compilation and combination of maps and sketches.
4. Department of *Languages;* French, German and Spanish.

THE BETTING RING.

$2,500 by Alan R. Hawley that no aeronaut in America can beat the record made by J. C. McCoy in the Gordon Bennett. Mr. Hawley considers Mr. McCoy the best pilot in this country and will allow six trials to be made to win this bet, all six attempts, however, to be made within six days and Mr. Hawley to be duly notified. Any takers?

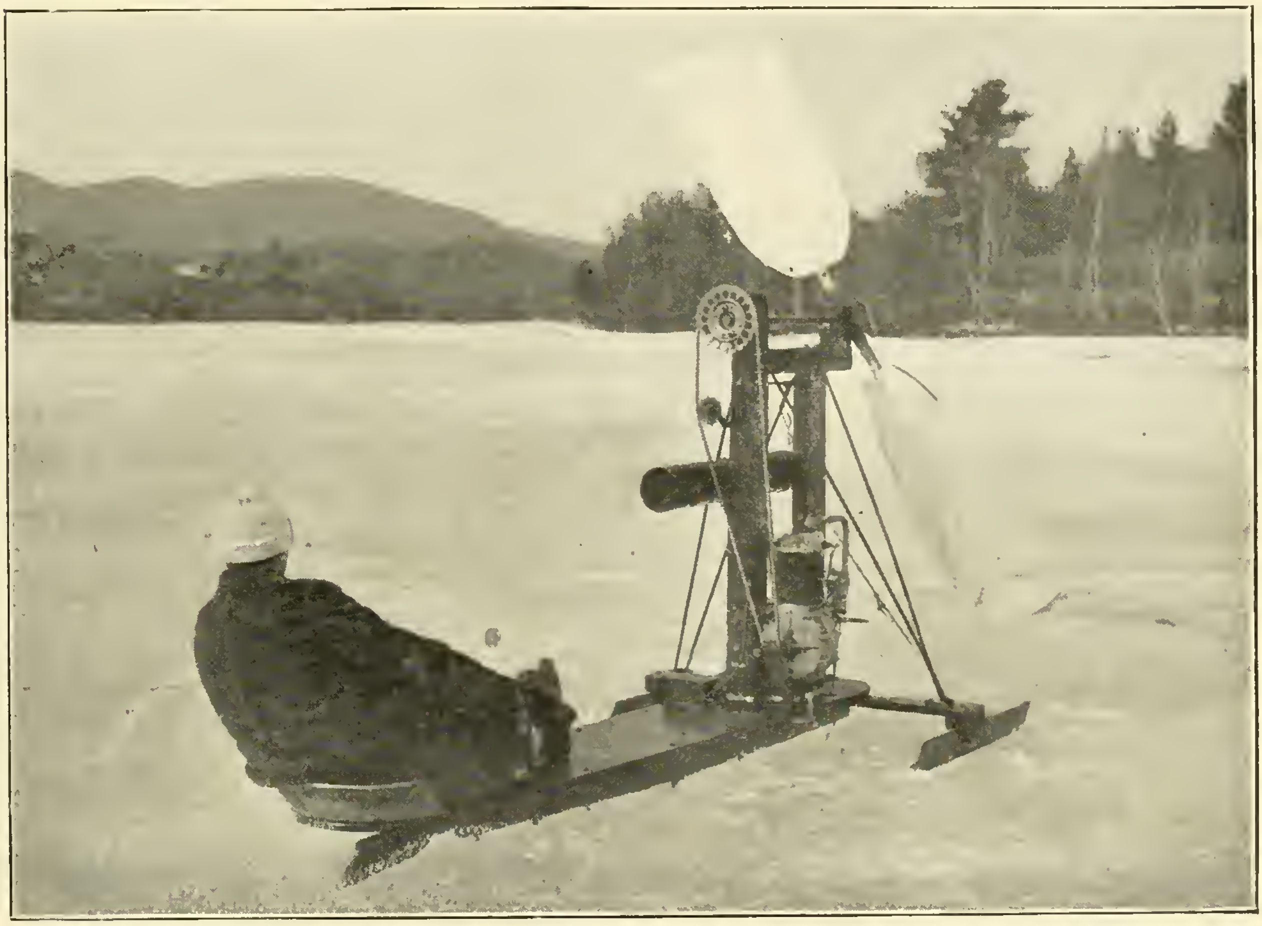
Chevalier Florio and M. Alfred Vonwiller have bet 100,000 francs even to fly in an aeroplane around the track at the hippodrome at Palermo before December 31, 1908. The length of the track is 1500 meters. If both competitors make the distance the money will go to the one making the fastest time.

M. Archdeacon suggests that the loser devote the sum to the cause of aviation, to be awarded to the aviator who accomplishes a flight of 25 kilometers in a circular course around stakes 1 kilometer apart. However, this plan did not meet with the approval of Chevalier Florio. He thinks that the money is at the disposal of the winner, to do with as he chooses, but states that when there is a reasonable prospect of seeing ten or a dozen aeroplanes likely to accomplish such a flight there will be a prize at hand.

A NEW TOY FOR MEN.

By William Bevier Ashley

No wind that day, nor the next one nor the next. Then ice-boat-race-day came and went without budging the club chimney's column of smoke, so Conill got mad clear through and went out after breakfast and built a motor ice-boat, and of all the sports to come I predict some of the finest with this new toy.



OF ALL THE SPORTS TO COME, I PREDICT SOME OF THE FINEST WITH THIS NEW TOY.
Photos by C. D. Moses & Co., Lake Placid, N. Y.

Conill began with the body, building it like the old-fashioned ice-boats that were in use up to the date of the Calm. Only, he tucked her shoes more modestly together. The beam measurement is about three and a half feet, length, fore and aft, seven feet. He had to refit her with runners several times before discovering the wide ones that keep her from playing she is an ice-cutting machine. The works were a foregone conclusion; they would have to consist of a sparker, carburetter, transformer, gasoline tank and so on. No one knows where he dug the parts from, but with delightful tact he selected different brands so as to give no manufacturer heartburn. The motor assembled, he next tackled the support for the blades which were to grip the immovable air and rip the boat along. Being three weeks from New York by freight, and befriended only by a sparsely equipped general blacksmith shop, Conill dove into his head for ideas. He came out with several pieces of scantling, which he sawed into two uprights and a crossbeam. The shaft to carry the blades ran through the top ends of the uprights and were decorated at one end with a wide sprocket wheel discarded by some bicycle, dangling a chain under the chin of the power shaft below. The wooden blades, about four feet long with a ten-foot swing, were gotten into the right shape and angle after only six rejections. Thus, about nine weeks after breakfast, Conill had spent his rage; and, spring being due, a tearing warm wind came over the hills for four days and left the ice like a

comb and brush. Then on that ridgy and mushy surface, Conill made ten miles an hour. that is to say, he demonstrated that a motor ice-boat is practicable for sport.

Conill's lumber pile weighs three hundred and fifty pounds, or about one hundred more than it needs to. It is absolutely crude. Think of that gallows to hang the blades on! Conill himself weighs one hundred and sixty pounds. His motor is 4 H. P. at the start-off, but loses one equine at least playing with the chain. Yet this home-made slap at the weather punched into it at the rate of a mile in six minutes.

Conill is entitled to an introduction to Aeronautic's readers. Allow me: Senor Fernan O. Conill from Havana. Mr. Conill had lived twenty-one years, some of them in Europe; but this was his first one in the United States. He was preparing for Harvard under a private tutor, Mr. T. M. Simpson, on the shores of Mirror

ON THAT RIDGY AND MUSHY SURFACE CONILL MADE TEN MILES AN HOUR.

Photos by C. D. Moses & Co., Lake Placid, N. Y.

Lake in the Adirondacks. Conill is well-born, well-built, and genial. The exploit of the motor ice-boat sufficiently attests his sporting qualities, if not,—he has tackled that impossibility now rivalling perpetual motion and patented an emergency brake for automobiles that will operate of itself, nearly. If this Cuban friend of the race gives the world a sure-thing emergency brake, it will be a benefit second only to this new element in sport.

The regulation ice-boat requires wind and room, not indigenous to every lake and stream. Even the necessary good surface is a whim of the weather.

Given all the conditions, nothing but racing astride lightning can equal ice-yachting; minus any of them, and nothing can equal it.

On the average tributary, stream and lake, an ice-boat gives the same sport as a catboat on a pond.

But the possibilities for sport are unlimited with a sixty-mile-an-hour motor ice-boat, or even a forty-miler. Perfected, the boat might carry auxiliary sails; be provided with wheels for transporting it under its own power; fitted to carry a crew of one to six;—what can't be gotten out of it? And, of course, the motor-driven

CONILL AND HIS LUMBER PILE WEIGH OVER 500 POUNDS.

Photos by C. D. Moses & Co., Lake Placid, N. Y.

ice-boat can be worked against the wind or on snow. Provide it with bunker springs, a flexible deck, a cabin and an oil stove, and nothing will be left in Arctic exploration but the fun of it. Seriously, Fernan O. Conill has made a great contribution to sport in the United States.

POSTSCRIPT.

Washington, D. C., February 8.—The Secretary of War has approved the recommendation of the Board of Ordnance and Fortification that bids for furnishing heavier-than-air flying-machines to the United States Government be accepted as follows:

	Price	Time of delivery
J. F. Scott, Chicago, Illinois	$ 1,000	185 days
A. M. Herring, New York	20,000	180 "
Wright Brothers, Dayton, Ohio	25,000	200 "

In all forty-one bids were received. These three were the only ones that complied with the requirements of the specification. It was part of the agreement in issuing the call for bids that none of the particulars of the bids were to be given out but retained as confidential.

INTERNATIONAL AERONAUTICAL CONGRESS.

President: Professor Willis L. Moore.
Secretary: Dr. Albert Francis Zahm. Chairman Gen'l Committee: Wm. J. Hammer.
Chairman Executive Com.: Augustus Post. Sec'y Committees: Ernest La Rue Jones.

Publication Notice.

The addresses, papers and discussions presented to the Congress will be published serially in this magazine and at the earliest date possible bound volumes will be distributed without charge to those holding membership cards in the Congress. Others may purchase the volume at a consistent price when ready or may take advantage of immediate publication by subscribing to this magazine at the regular rate.

In accordance with the program as published in the November number, the informal addresses of the Gordon Bennett contestants and others were concluded before entering upon the printing of the formal papers and discussions.

The fifth paper is presented in this issue: "Experiments with Model Flying Machine," by Edward W. Smith.

Experiments with Model Flying Machine, Being a Resume of a Thesis Submitted in 1901 to the University of Penna., by

Edw. W. Smith.

The machine, of the aeroplane type, was designed on the same lines as four preceding ones, use being made of the data obtained by Langley with his whirling arm to calculate the probable power, speed, etc., required to support it.

The primary object was to ascertain whether the general form which had proved successful in the smaller machines would also prove stable and otherwise satisfactory in a machine of size and weight sufficient to deduce the probable performance of a full size man carrying apparatus.

As the work proceeded, a system of measurements, begun for the purpose of ascertaining the cause of failure of the last previous model, was extended until it became possible to measure with considerable accuracy the speed, efficiency of propellers, and power expended during actual flight; these measurements thus becoming a second objective.

The general design of the machine embodied a system of narrow superposed planes *AA* curved upward toward the ends, and approximately flat in the narrow or fore and aft direction. These planes or wings inclined slightly upward are made to carry virtually all the weight of the machine, while a directing plane *B*, behind them, and normally about level, serves to maintain the wings at the desired angle with the horizontal. Two propellers *CC* driven directly by a large bundle or "sennit" of elastic rubber threads serve to give the necessary thrust forward. The center of gravity of the whole is adjusted to lie a little forward of the middle of the wing, and about midway in a vertical direction. Any change in the inclination of the wings is effected by changing the angle between tail and wings.

The machine is given initial velocity by a launching track, operated by a stretched rubber sennit, and the length of flight is limited by the energy stored in the rubbers to about 120 feet.

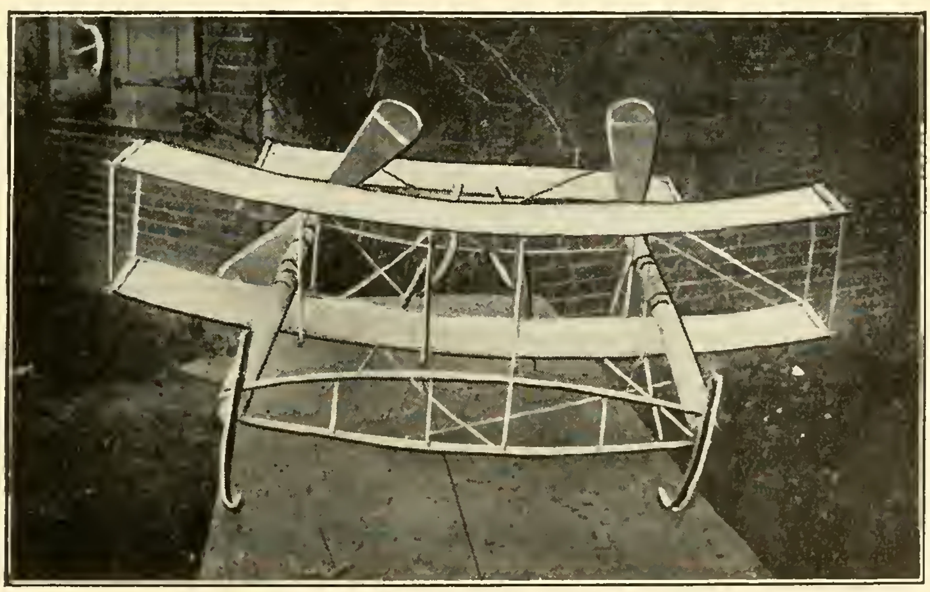
The primary object of the test of this machine, the question of stability, is certainly one of the most important in connection with aeroplanes, so few words may be in place as to the theory upon which the machine was built.

The curved wings, with the center of gravity about central with the supporting surface, that is a little higher than half way between the two wings, gives good sideways stability; any puff of wind from either side being met by a rise of the

wing at that side. As to the fore and aft question, three main conditions were observed. First, the main supporting surfaces should be very narrow, so that any shifting of the center of support ahead of or behind the center of gravity must be slight; any requisite number of superposed wings being employed to give the necessary area. In the case of a few very wide wings, as frequently employed, a slight percentage displacement of the center of support ahead or behind the center

RESTING ON TRACK READY TO START.

of gravity causes a considerable moment tending to make the machine dip or rear. Second, the directing plane or tail must be sufficiently behind the wings and sufficiently large to easily take care of any moment which may come from a displacement of the center of support; in the model the tail is behind the wings rather more than one-half their breadth, and is about one-third their surface. Third, the tail must normally lie very nearly horizontal, that is, must make an angle (measured



RESTING ON LEGS UPON A TABLE.

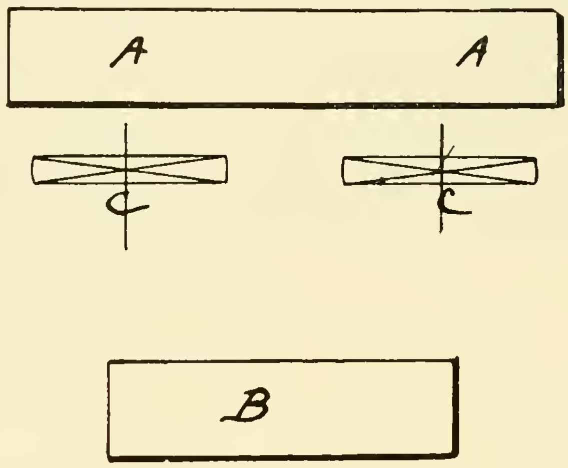
above) of less than 180 degrees with the wings, as shown in the diagram. For, suppose that owing to a falling off of speed or other cause the upward pressure on the wings decreases. At once the wings drop, and the machine begins to take a plunge downward; the resistance now decreases or the machine perhaps begins even to coast, and gains in speed, when the downward slip of the wings decreases and gradually the normal position is restored. If, on the other hand, the upward

pressure becomes too great, the wings rise and assume a greater angle with the horizontal, resistance increases and speed is cut down, slip increases and the wings fall till equilibrium is again reached.

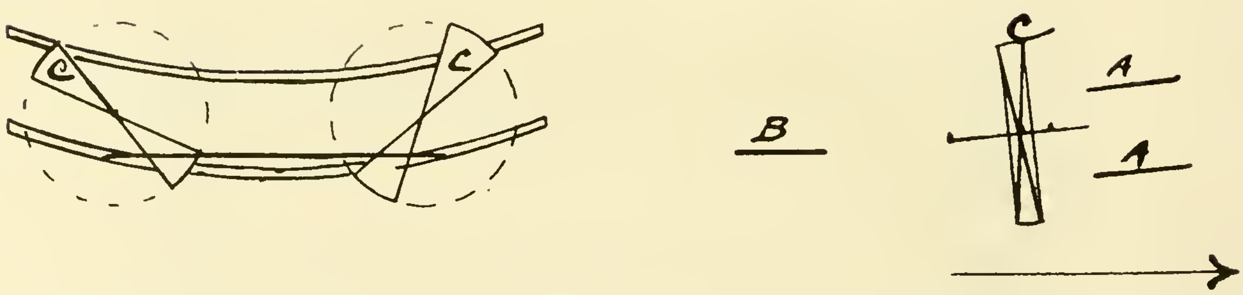
Were the tail, on the other hand, inclined more than 180 degrees (measured above) to the wings so soon as the machine started downward, the tail would tend to increase the effect and the machine must end by making a somersault.

Regarding the correctness of these principles, it was found that the model would fly with great regularity until the power gave out, the height of the flight being varied at will by changing the angle of the tail.

Gusts of wind were more than once encountered, but were always met easily by the machine with an inclination one way or the other, an upset or a sudden dive having never occurred. The four long downwardly projecting springs of wood, easiest described as legs, for the purpose of breaking the fall, generally served their



Plan.



The machine described has a breadth of 4 feet, wings 8 inches wide and 8 inches apart.—Ed.

purpose of preserving the main structure, though frequently giving out themselves. Sometimes being blown into obstacles or alighting crooked the outer wing structure was damaged, but in a total of over two dozen flights, only three, all owing to carelessness, were failures.

It is interesting to notice that, used as a kite, a machine of the kind described is not stable, many attempts to fly it having entirely failed.

We now come to the second objective, the measurement of speed and power expended. For determining the speed, a recording drum was provided, driven at a uniform speed by clockwork, and upon which bore a pencil, caused to move lengthwise by a long screw with axis parallel to that of the drum. Mounted on the long screw was a light wood pulley on which was wound a long piece of thread. The whole recorder was placed behind the starting track, and the free end of the string was made fast to the tail of the machine.

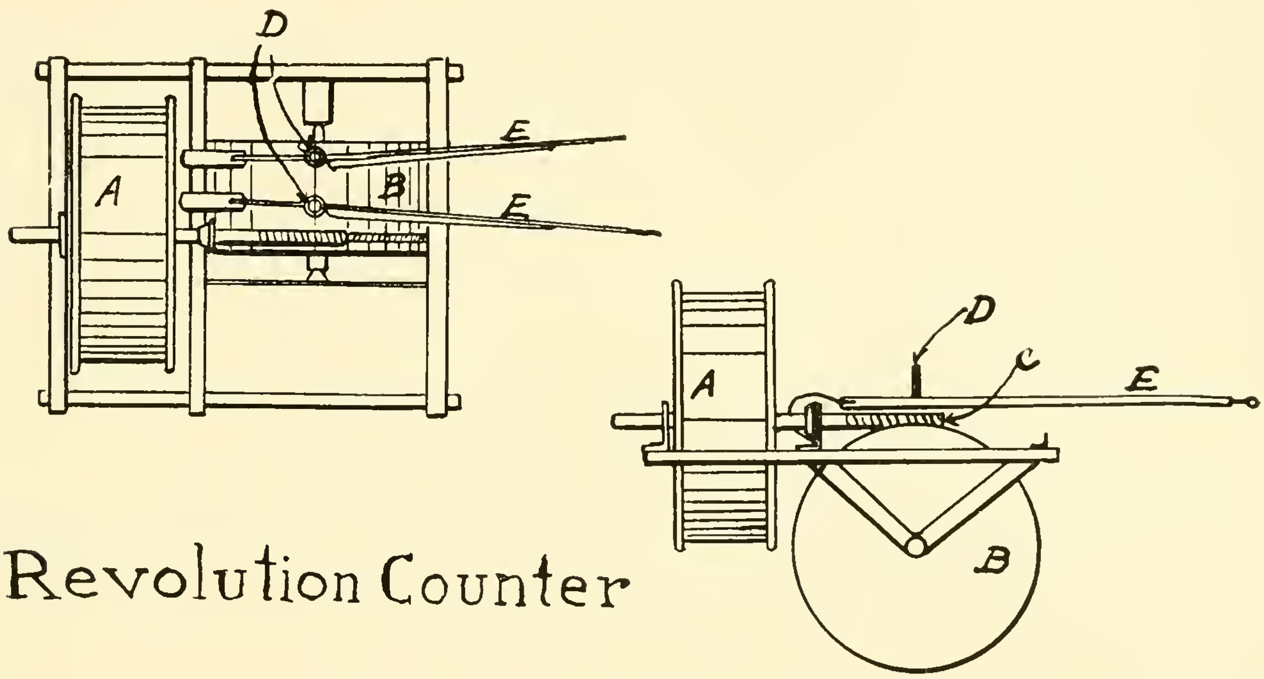
When the machine was then flown, the pencil would move lengthwise over the drum, and a curve would result whose abscissae represented time, ordinates distance and slant speed. Curves 41-44, pages 24-25, were made in this way and indicate the general performance as regards speed.

The clockwork used to operate the drum was not very good, but a calibration at the time of the experiments virtually eliminated errors from this source.

The next step was to record the revolutions of the propellors, and though some difficulty was experienced at first, the apparatus shown herewith proved quite satisfactory.

It consists of a pulley *A* which, by a worm, drives a drum *B* at a much reduced rate of speed. Two pencils *DD* mounted upon flexible arms *EE* are made to mark upon the drum *B* as it revolves.

The whole apparatus is mounted upon the flying machine, the two arms *EE* are connected by threads to pins slightly out of center on the propellors, and a long thread with the free end fast to the ground is wound upon the pulley *A*. As



Revolution Counter

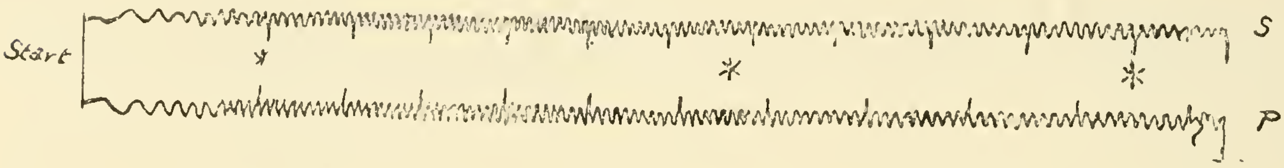
the machine is flown then the string unwinding from *A* rapidly revolves it, the drum *B* slowly revolves, and the pencils *DD* trace upon it sinuous lines, the successive peaks of which represent revolutions of the propellors. Cards 3, 4, 5 and 6, pages 24-25, were made in this way, simultaneously with 41-44 already described.

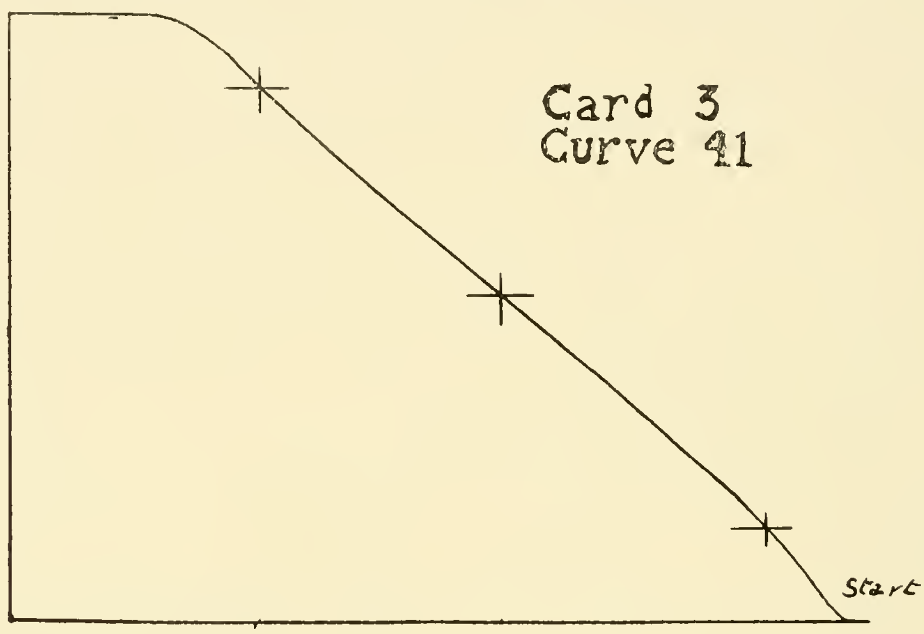
Comparing now a corresponding pair of diagrams we can get the rate of revolution of both propellors, and if the characteristic of the rubber sennit is known, this will give at once the power.

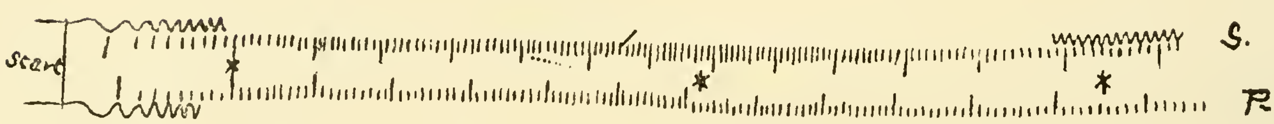
The apparatus for measuring the torque of the rubber, already developed in connection with the previous machine, is herewith shown in its final form. *A* represents the rubber sennit, about 40 inches long, ½ lb. weight. It is carried in an open frame *BB* supported on two bearings *CC* and free to turn about its long axis. Attached to one end of the frame is a drum *H*, with two cords fastened to opposite sides, one being fixed at its end, the other connected to a calibrated spring *J*. The rubber sennit is fixed to the frame at one end and at the other to a shaft carrying a flat piece of wood or "dummy propellor *D*. Mounted on the propellor shaft is also a small pulley *E*, which by means of a cord belt *FF*, and a set of reducing gears communicates to a drum *G* the revolution of the propellor.

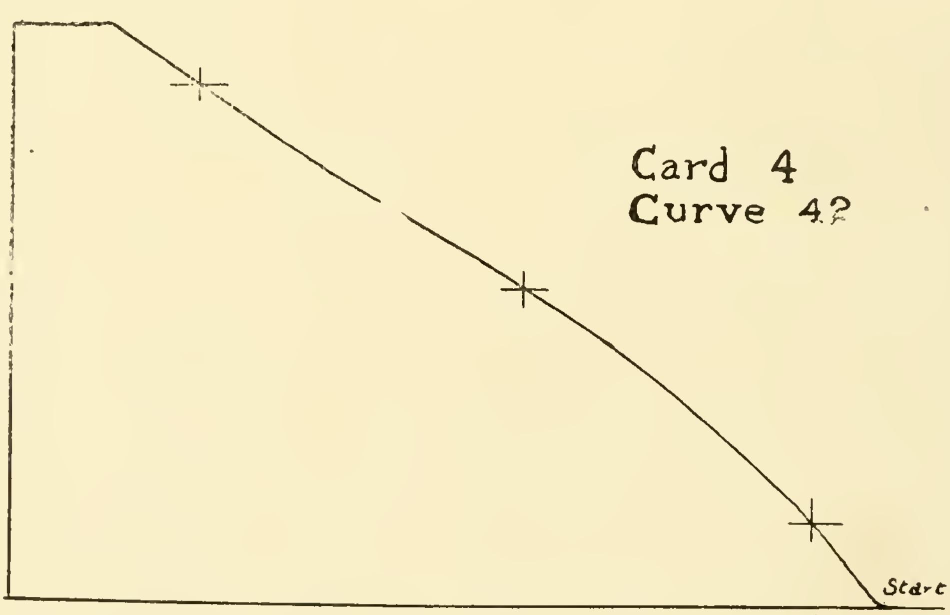
If, now, after being wound up, the dummy propellor be allowed to unwind; 1st, the drum *G* will be turned around at a proportional rate; 2nd, the pencil *K* will

indicate by its position the torque exerted by the rubber upon frame and propellor. Two pairs of diagrams taken in this way are shown below, the upper line in each case giving the torque on winding up, the lower on unwinding; the verticals divide the cards into spaces of ten revolutions each. Having now the three sets of cards as





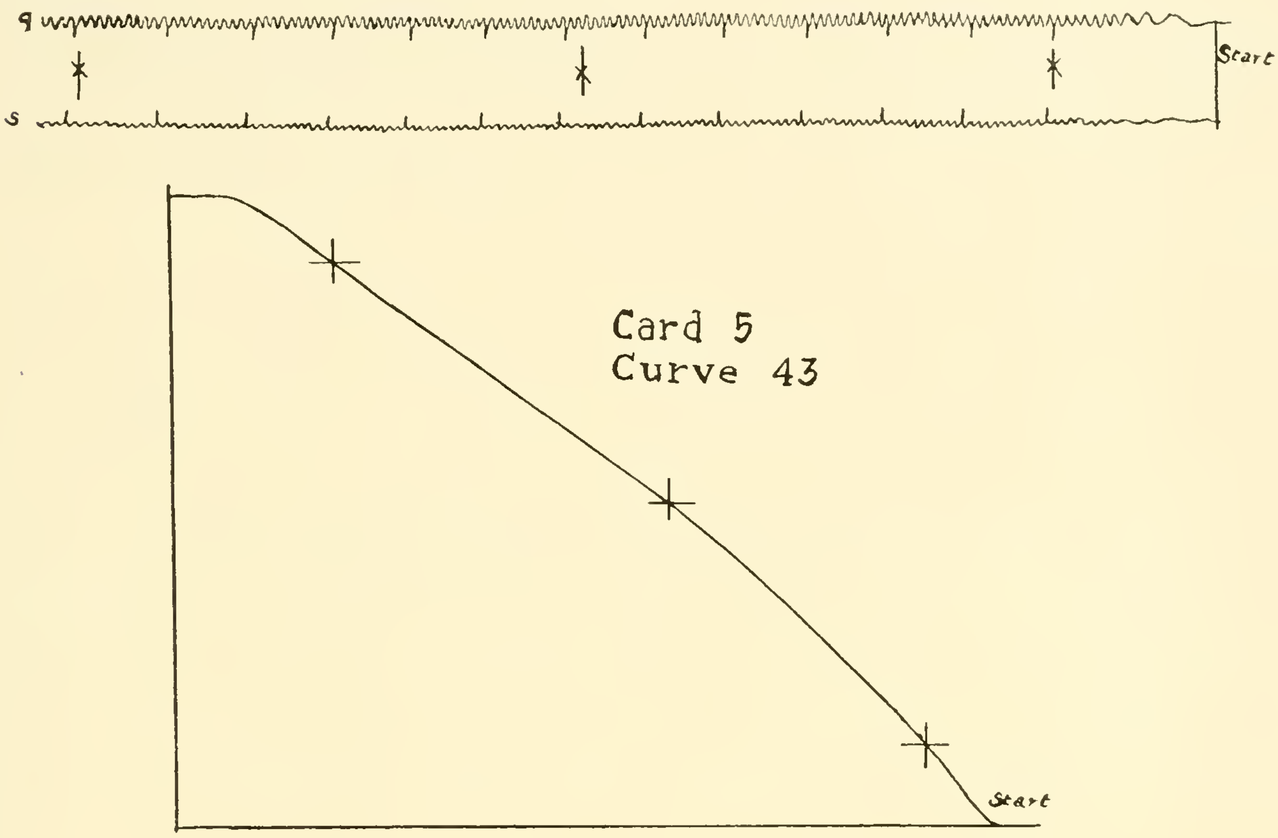


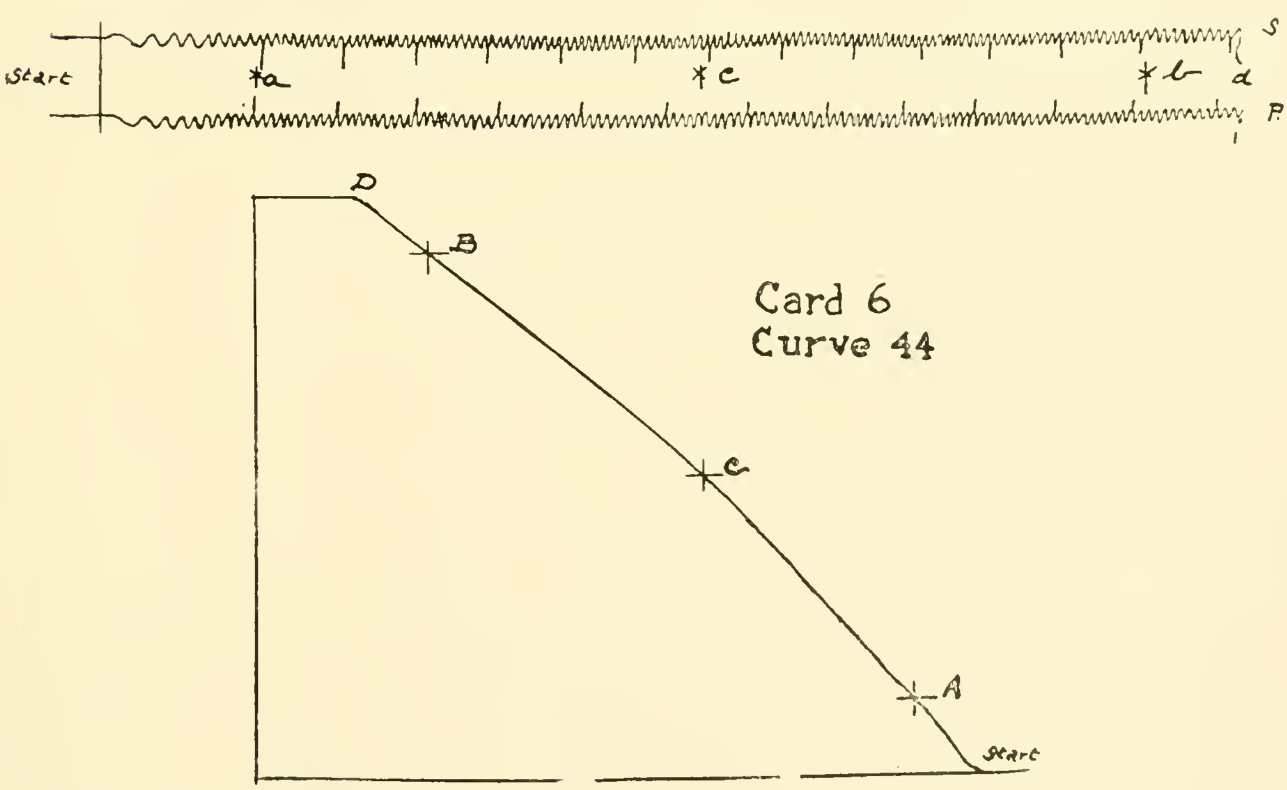


described, we are in a position to make the calculation of power as outlined, and the method of making this calculation follows, for one particular set of diagrams, card 44.

The total height of the speed card is 2.86 inches, which corresponds to 142 feet of flight, including about 12 feet on the track.

Total length of revolution card, 5.54 inches, corresponding to 141 feet of flight.





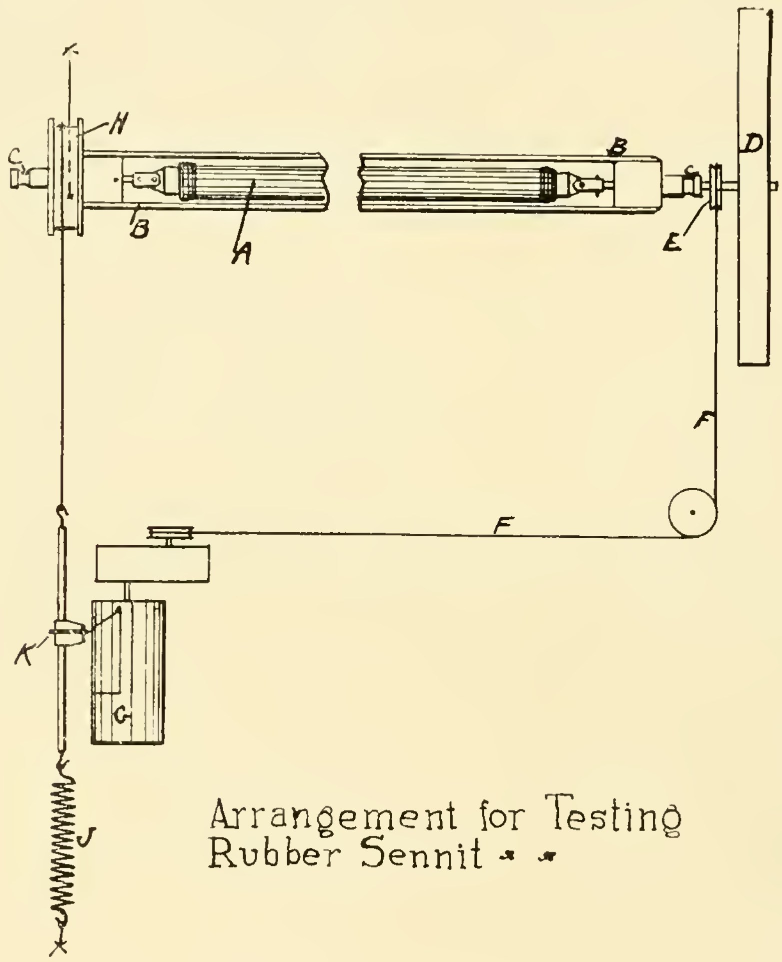
Inspection of the revolution card shows that about ten revolutions were required by the propellors to attain their full speed, the machine covering in this time 19 feet. This first 19 feet will therefore not be considered as part of the flight, the part beyond 129 feet being likewise discarded, since the rubbers were

run down by that time, and the machine was only soaring and rapidly descending. The two points, 19 feet and 129 feet, are now marked on both cards *AB*, *ab*, and the horizontal distance on the speed card is measured and found to be 2.33 inches, which indicates that 4.6 seconds were consumed by the machine in covering the 110 intervening feet. From the revolution card it is found that in this same interval of 110 feet the port propellor made 112 revolutions and the starboard 122, and by now referring to a table from cards 51 and 52, the work done by each rubber sennit during the interval is obtained.

In this manner it is found that the port propellor received 131 foot-pounds and the starboard 127, total 258. This being expended in 4.6 seconds it follows that

the mean power was $\dfrac{258 \times 60}{46 \times 33000}$ .102 H. P.

The total weight of the flying machine (including revolution counter) was at



Arrangement for Testing Rubber Sennit

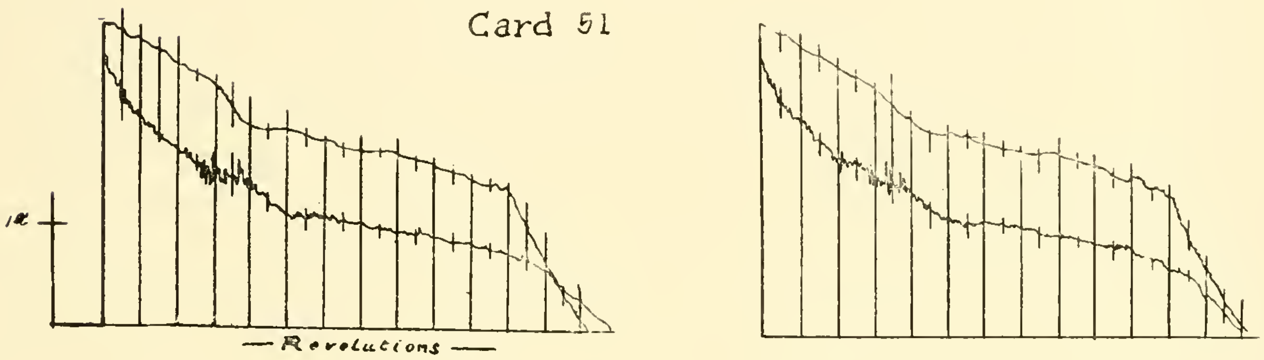
the time of these tests 4.0 lbs. It thus maintained itself in the air with a ratio of 39 lbs. per horse power.

Owing to the fact of the rubber sennits running down toward the end, the power is quite different during the first and second halves of the flight, and while it may perhaps be questioned whether during the latter half the machine really maintains itself by its own power there is, I think, no reasonable doubt that it so does during the first half. On this account all of these cards (41-44) have been divided approximately into two halves and the power calculated for the whole flight (barring the two extremities) and for the first half. It will also be interesting to calculate the power for the whole length of flight, taking into account the kinetic energy of the machine at start and finish, and also the energy gained by the machine dropping through 8 feet owing to the slope of the ground.

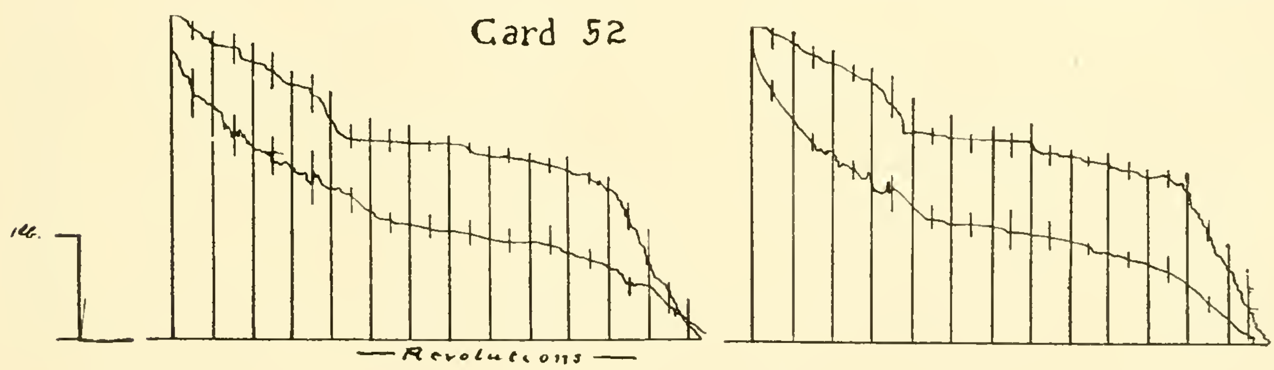
In the case of card No. 44 we find the speed at point A (about 7 feet after leaving the starting car) to be 19.4 miles per hour; time from A to D 5.29 seconds at D (point of grounding) speed was 12.3 miles per hour; total energy delivered to propellors 305 foot-pounds.

The total energy expended therefore was:

Given to propellors	305	foot-pounds.
Kinetic energy at start	51	" "
Energy gained by descent of 8 ft.	32	" "
	388	
Kinetic energy at finish (lost when machine grounded)	20	" "
	368	" "



Card 51



Card 52

368 foot-pounds therefore maintained the machine in the air for 5.29 seconds or the mean power over this time was .126 H. P., at the ratio of 31.8 lbs. supported per horse power.

The following table gives the principal quantities derived from each of these pairs of cards:

	A			B			C	
Card.	Distance.	Speed.	Wgt.—H. P.	Dist.	Speed.	Wgt.—H. P.	Dist.	Wgt. H. P.
	feet.							
41	91	15.0	38.9	48.5	15.2	30.0	104	27.5
42	96	12.1	46.3	52.0	13.8	32.2	109	36.8
43	111	14.1	45.5	54.0	15.8	32.0	126	35.8
44	110	16.3	39.2	55.0	19.4	27.8	123	31.8
Mean		14.4	42.4		16.05	30.5		33.0

The three columns A, B and C, show the quantities derived from each card in the manner above illustrated; all begin at the same point, i. e., 19 feet from position

of rest or about 7 feet after leaving starting truck; in columns *A* that part of the card is considered between 19 feet (marked *A* on cards) and virtual end of flight *B*, the rubber sennits during this period being considered as furnishing all the propelling power. Columns *B* are derived from first half of the cards (*A-C*) in the same manner as are *A*, while columns *C* are taken from the point *A* to the very end of the card *D*, the energy used in this period being considered as the sum of the kinetic energy of the machine at *A*, the total energy stored in the rubber sennits; and the energy of the machine dropping 8 feet during flight, minus kinetic energy at point *D* (where this was clearly indicated).

The four sets of cards were all taken the same day, late in the Fall of 1900, and not under the most favorable conditions, as there was considerable breeze at the start, which gradually died out. The flights were timed between puffs, as far as possible, yet on the first, No. 41, the machine was struck pretty hard, being carried about 25 feet off its course, and over a fence into some rough ground where a slight damage was sustained in alighting. The wind being from the forward quarter shortened the length of this flight considerably.

On the second trial the machine was again struck by quite a breeze from ahead this time, and partly owing to this the first part of the flight was very high and the speed accordingly was cut down a good deal, and afterward recovered somewhat during the descent.

Prior to No. 43 the tail was a little flattened, making the course of the machine nearly level, though a little high at first.

For No. 44 it was flattened still further, producing a good average flight, a little upward at the start, with a gradual descent as the power lessened and gave out. As, moreover, there was no perceptible wind at this time this card is the fairest one upon which to build.

Incidentally the revolution cards 3, 4, 5, 6, furnish data for measuring the slip of the propellors, and if the friction of the blades be also measured, as was afterward approximately done on the apparatus shown on page, the efficiency is easily calculated. These calculations were made and showed a slip varying between 23 and 32 degrees and efficiency of 61 per cent. as a mean of the four flights recorded. The method of finding the friction was to mount the propellor and measure the thrust produced by it as the rubber sennit unwound; from this the pitch was then calculated, the torque utilized and the difference between this and the actual torque produced by the sennit was taken as representing the frictional loss. Assumed as varying with the square of the speed of revolution; this was then calculated for the speed shown by the revolution cards and the above mean result obtained.

CONCLUSION.

As to the significance of these tests with regard to a full sized machine, it looks as if the same principles of balancing should obtain independent of size, and the large machine should be stable as well as the small one. As to the questions of weight and power the inference is not so clear perhaps. For, although a gasoline engine can be made giving a horse power for less than 10 lbs., thus leaving about 20 lbs. for wing structure and dead weight, yet the weight of the wings would probably increase faster than the surface, and there might be left very little margin for the dead weight.

On the other hand the stresses can all be calculated and members designed accordingly in a large machine, and all entering edges can be sharpened to reduce friction. The small machine, moreover, was under a good deal of disadvantage in having to be strong enough to stand a strain of about five times its weight when shot from the launching track, while the large machine could simply run on the ground with its own propellors till speed was attained.

These questions of power and weight have been for the most part answered since the experiments described were carried out, but there seems still to be a little chance left to improve the balancing qualities, and in the parts referring to this phase of the question probably lies any value which may attach to the tests.

EDW. W. SMITH'S PAPER.

Discussion by O. Chanute.

The paper of Mr. Edw. W. Smith is a very clever one, and he is entitled to great credit for having demonstrated by precise measurements the power required in horizontal flight by the type of aeroplane which he experimented with; also, for having suggested, as early as 1901, that "A large machine provided with wheels to run on the ground could of itself attain the necessary initial velocity without a launching track, and could presumably be brought down gradually so as to land easily upon the wheels," this being the method since independently adopted by Vuia, Santos Dumont, Delagrange, Blériot, Farman, and other French experimenters.

Mr. Smith arrives at the conclusion that this type of machine can sustain a gross weight of at least 28 lbs., and very probably 33 lbs. per brake H. P., which result is almost identical with those obtained by Langley's model, but quite inferior to those of Wright Brothers, who sustained 925 lbs. with 17 H. P., or at the rate of 54.4 lbs. per H. P. The difference probably arises from the latter's arching fore and aft of the sustaining surfaces, (a la Lilienthal) while Mr. Smith's surfaces were flat; also from the head resistance of his framing and revolution counter. In most full size flying machines the head resistance absorbs from one-half to two-thirds of the power required and hence the French experimenters are providing motors which give out power at the rate of 14 to 22 lbs. sustained per H. P.

The wings of Mr. Smith's aeroplane are curved upward toward the ends, producing the effect of the Langley dihedral angle which has been adopted by almost all the French experimenters. This is probably the best arrangement to secure transverse equilibrium at the low speed obtained of about 15 miles per hour. This resembles the attitude of the soaring hawk; but for high speeds and tumultuous winds it would probably be better to curve the wings slightly downward at the ends thus resembling the attitude of the gull. My own experiments with full-sized gliding machines showed that the best stability was obtained with wings depressed downward at the ends, 4 inches on a span of 16 feet.

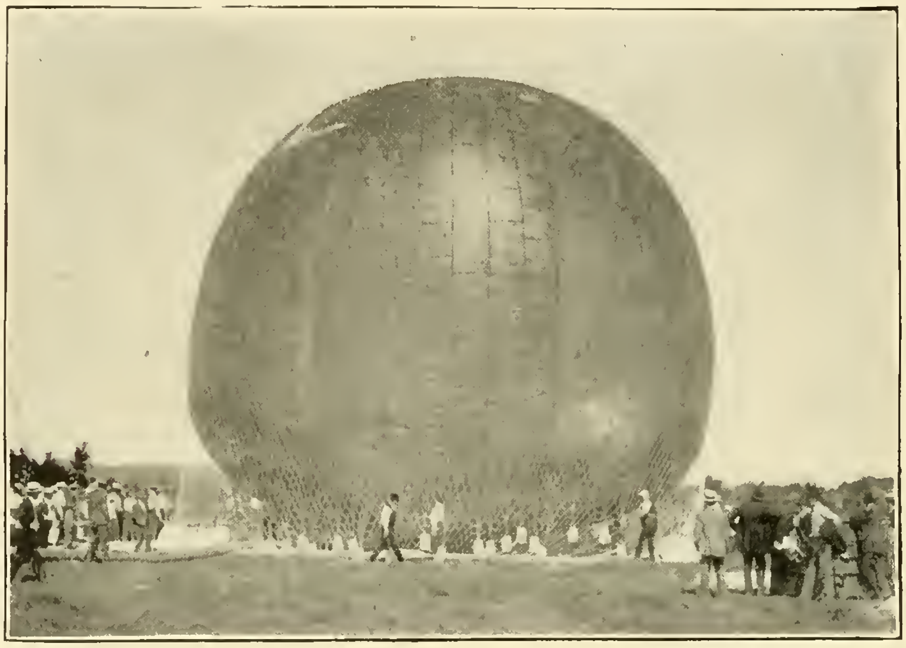
Mr. Smith's measuring instruments are quite ingenious and it is not probable that the necessity for attaching a thread to his model materially affected the results. Of course, on a full size machine different instruments would be required. The speed could be measured by an anamometre and the revolutions of the propellers by a revolution counter; but it would be necessary to ascertain in advance what output of power corresponded with a given number of revolutions, for it would be somewhat awkward to try to take indicator cards while in full flight in order to measure the power at the motor.

AERONAUTICS IN CINCINNATI.

By Louis Horn.

Herewith is shown the 87,000 cu. ft. balloon built by Leslie B. Haddock, proprietor of the American-La France Balloon Co., and owned by The Union Gas & Electric Co., of Cincinnati, O. This balloon, in fact is the second largest in the United States. The Ben Franklin in Philadelphia being 5,000 cu. ft. larger.

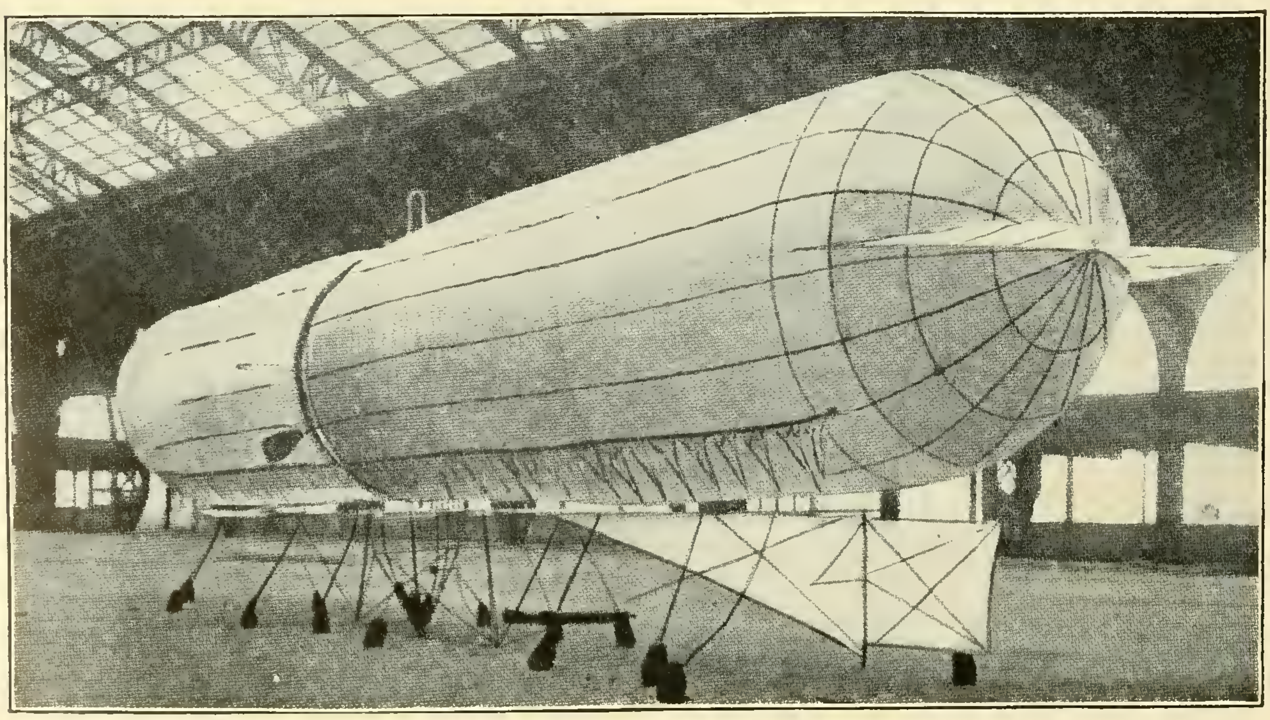
The three-cornered white mark at the left of the valve is the rip section, which at the first inflation was ripped by a laborer who thought that every rope in the vicinity had to be held with his whole weight. The particulars of the outfit are as follows:



Diameter of bag, 55 feet; actual capacity, 87,135 cu. ft.; car, 4½ ft. long, 3½ ft. wide, 4 ft. deep, made of India reed over a steel tube frame, upholstered in red leather with ground cork padding; net of Italian hemp; 27-in. butterfly valve; 20-ft. ripping section; the bag is built of a combination of linen and cotton, giving strength with a minimum of weight, three coats of varnish by machine, five coats by hand, is heavily reinforced at the apex and neck, and is triple sewed; walnut load ring, laminated. This outfit has been entirely rebuilt since last Summer.

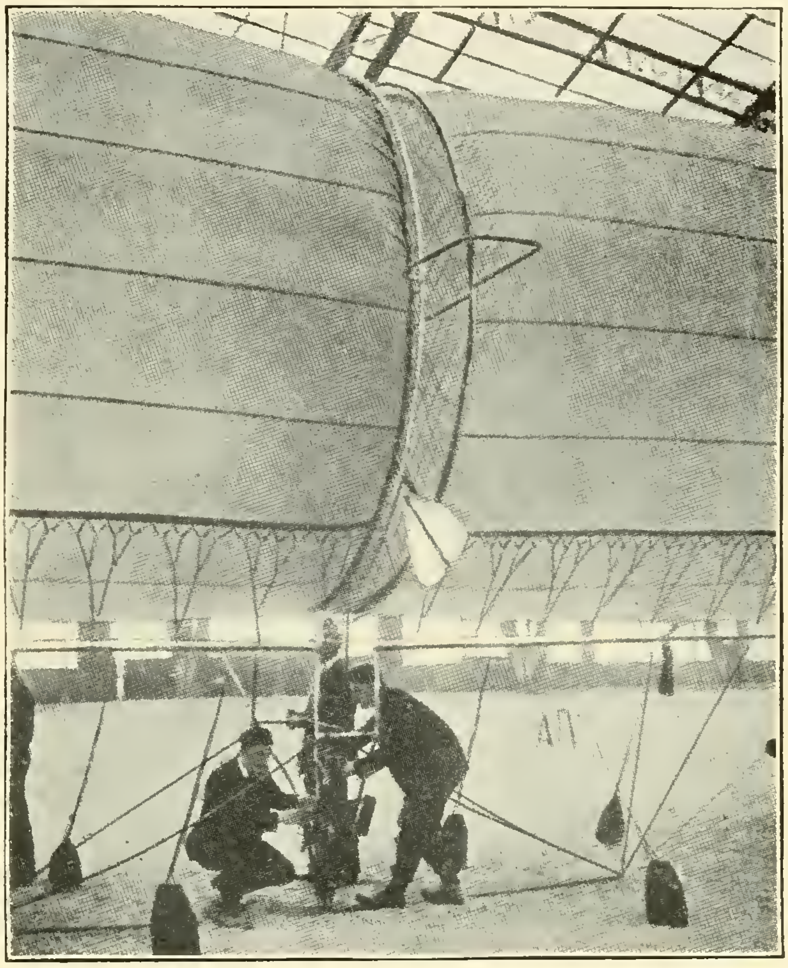
THE DE MARCAY-KLUYTMANN DIRIGIBLE.

A novel airship has been constructed by the Baron Edmond de Marcay in conjunction with M. Kluytmann, a Dutch engineer, in The Galerie des Machines, Paris. Its pe-



THE NEW DE MARCAY AIRSHIP.

culiarity consists in dividing the gas vessel, which is very long, into two entirely distinct sections at the middle, and in mounting the propeller, which is of enormous diameter, in the gap thus provided. The illustrations show this construction very clearly, the general view showing the extent of the gap between the two sections of the gas vessel, while the other illustration shows in greater detail the manner in which the gap is bridged by an iron cage in which the propeller revolves. One of the propeller blades is visible in the illustration, where it is seen jutting out beyond the surface of the gas vessel. The blades, which are two in number, and appear comparatively small on account of their position, are mounted on very long arms, which revolve upon a spindle carried by the iron cage. The motor is carried on an under frame below the gas bag, transmission being by means of a long belt. Experiments made in the Galerie des Machines, the balloon being guided along by a rope, were thoroughly satisfactory. As soon as possible outdoor experiments will be undertaken, for as the propellers have been arranged to improve stability it is only by trials in a wind that their real worth can be determined. The construction of the gas vessel itself calls for no special comment, but it should be noted that it is equipped with longitudinal aeroplane surfaces, a horizontal rigid plane at the rear, and a vertical rigid plane terminating in a vertical rudder beneath.



THE DE MARCAY AIRSHIP WITH ITS NOVEL PROPELLER.

THE PISCHOF AEROPLANE.

Pischof has made an interesting study of shapes for aeroplane surfaces and was led to decide in favor of surfaces with heavy front edges, as already extolled by several aviators, notably Goupil, and the adoption of a very efficient profile, approaching closely that of wings of birds.

According to the data of his preliminary experiments, Pischof first constructed a trial glider, without motor, of 10 meters spread of wings and 24.6 square meters of surface, in which the front edge of the carrying surface had a thickness decreasing from the middle of the plane to the rear extremities. This experimental apparatus gave very good satisfaction.

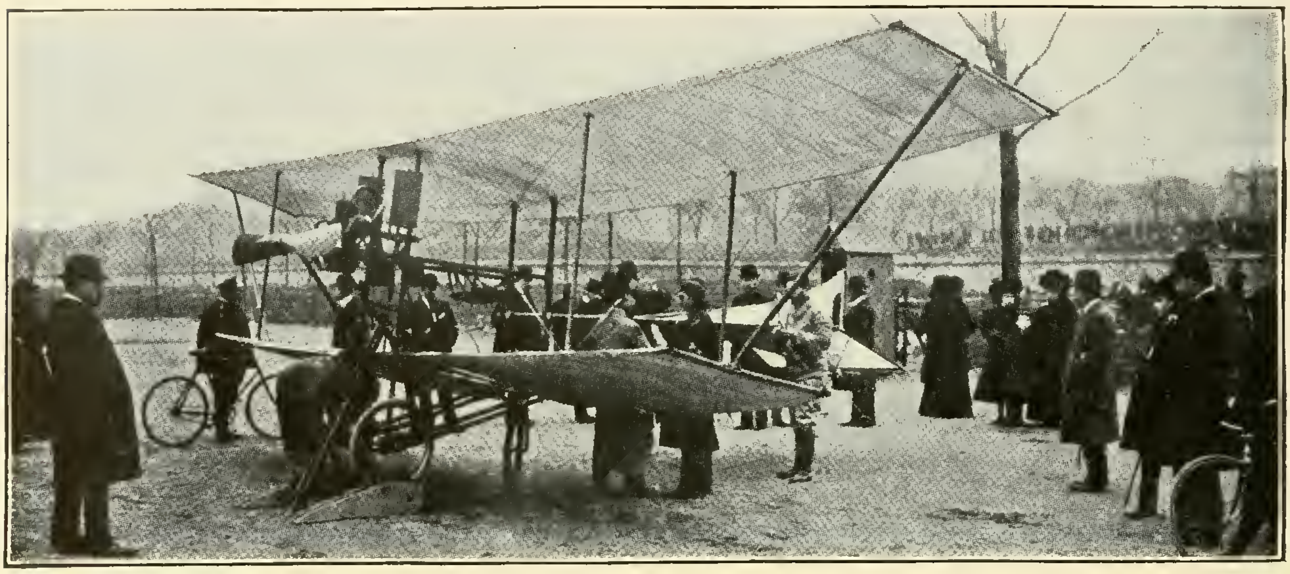
The inventor next undertook the construction of another aeroplane based on the same principles, and the preliminary experiments have already begun at Issy-les-Moulineaux.

This machine comprises an upper carrying plane slightly arched from front to rear so as to present an upper concavity. This plane is rigidly secured by a structure of wood, with steel wire cross bars stretching to the lower plane, which is smaller and is divided in two sections to allow room in the center for the motor and operator.

At the rear is a stabilitating tail consisting of a single surface divided in two sections, somewhat analagous to that in the Bleriot aeroplane. Between the two sections is the rudder consisting of a vertical frame covered with canvas.

The motor is an "Anzani," developing 25 h.p., with three cylinders, which operates a

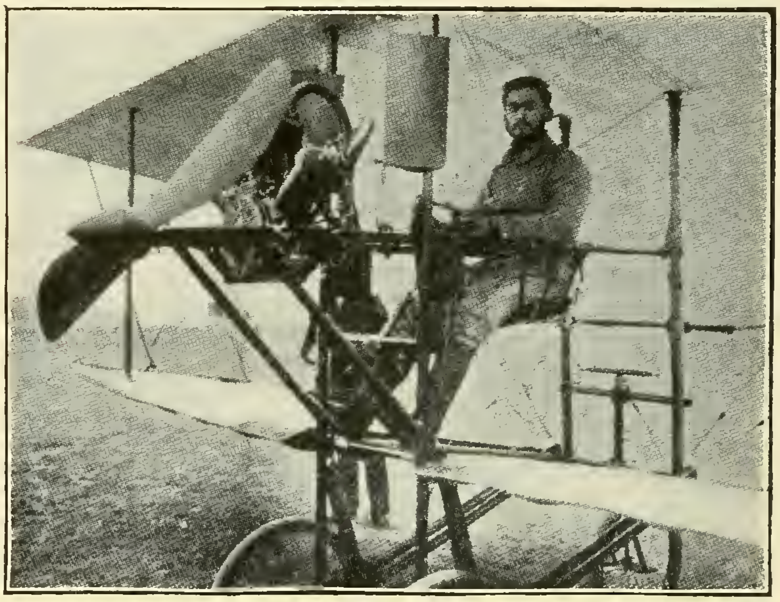
very interesting propeller built of wood by the engineer, Lucien Chauviere, situated in the front of the structure.



THE PISCHOF AEROPLANE GETTING READY FOR A TRIAL.

The aeroplane is supported on a chassis with three wheels, two in front and one behind, all rubber tired, and the latter is controlled by the rudder.

At the testing grounds of Issy-les-Moulineaux this aeroplane of Pischof moved on the ground at a gait estimated at approximately 40 kilometers per hour on November 14th, operated by Pischof and covered several times distances ranging from 100 to 250 meters, but did not always follow a true course, making several lurches away from the intended direction. In one of the attempts to turn it happened that only one of the front wheels remained on the ground. The operator was unable to master the machine or stop the motor in time. Invariably the apparatus would strike one of the trees surrounding the testing grounds, being arrested by striking in front while the rear was at the height of the branches. Pischof disengaged himself without injury from the network of wires and girders in which he was entangled. Contrary to what has been said, the aeroplane proper was not injured; the propeller only was seriously damaged by the shock. This has been replaced by another propeller of the same design and the trials will be resumed.



M. PISCHOF IN THE AVIATOR'S SEAT READY TO START.

AIRSHIP AND BALLOON TOURNAMENT FOR BRETTON WOODS.

Messrs. Anderson & Price, the managers of the famous White Mountains hotels Mt. Washington and Mt. Pleasant at Bretton Woods, N. H., have announced a tentative program for an airship-balloon-automobile meet about the middle of July. There will be an automobile run from New York via "The Ideal Tour" route. A little later will follow the dirigible races, starting from the level ground between the two hotels and coursing to the top of Mount Washington and return. It is also hoped to have a balloon ascent or two at the same time. Mount Washington has been used for some time by Mr. S. P. Fergusson, of Blue Hill Observatory, in obtaining upper air data.

ARMY AERONAUTICS FOR JANUARY.

Dirigible.

In response to the advertisement for bids for a dirigible, General Allen received the following, which were opened on January 15th, with the result as stated:

"Harry B. Schiller, Philadelphia, Pa., $25,000; Wm. Reifercheid, Streator, Ill., $5,000; Chas. J. Strobel, Toledo, Ohio, $8,000; Carl E. Myers, Frankfort, N. Y., $9,996; E. W. Creecy, Washington, D. C., $12,500, and John M. Karries, Mt. Vernon, N. Y., who bid on a flying machine which, if it attained a speed of 20 miles per hour, was to cost from ten to fifteen thousand dollars, and, if it attained a speed of 40 miles per hour, was to cost between twenty-five and thirty thousand dollars.

"As none of these proposals was satisfactory, all were rejected and new proposals will be opened on February 15th."

On January 21 a new advertisement and specification was issued for a dirigible balloon. There is one principal change, suggested in our January issue: That of allowing the bidder to furnish his own material. This is consented to in the new specification. There is no change in the speed to be required. A few more details are asked regarding the motor, propellers, frame, suspension, etc.

Dynamic Flyer.

The specification for dynamic flying machine remained unchanged, except that notice was issued permitting the bidder to "preserve as confidential any features of his machine which he wishes to keep secret. In describing the flying machine features which are omitted should be referred to with a remark to the above effect." What is the use of submitting plans at all? The greatest value in the plan is the point which the inventor desires to keep secret. Flying machines always fly—on paper.

ON THE DETERMINATION OF THE SPEED OF FLYING MACHINES.

By Otto G. Luyties.

The method of determining the speed of dirigible balloons and dynamic flying machines indicated in the recently published specifications of the United States Government is incorrect in theory and would be unfair in practice.

As the matter may be of some future importance, it merits a detailed discussion. The following quotation constitutes paragraphs 4 and 5 of the specifications for a dynamic flying machine, the proposed method of testing the dirigible balloon being similar.

"4. The flying machine should be designed to have a speed of at least 40 miles per "hour in still air, but bidders must submit quotations in their proposals for cost, de- "pending upon the speed attained during the trial flight, according to the following scale:

"40 miles	per	hour,	100%.		"Less than 36 miles per hour, rejected.				
"39	"	"	"	90%.	"41 miles	per	hour,	110%.	
"38	"	"	"	80%.	"42	"	"	"	120%.
"37	"	"	"	70%.	"43	"	"	"	130%.
"36	"	"	"	60%.	"44	"	"	"	140%.

"5. The speed accomplished during the trial flight will be determined by taking an "average of the time over a measured course of more than five miles, against and with "the wind. The time will be taken by a flying start, passing the starting point at full "speed at both ends of the course. This test subject to such additional details as the "Chief Signal Officer of the Army may prescribe at the time."

It should be observed in the first place that the specifications provide a large premium for high speed. A machine flying at the rate of 44 miles per hour during the test is valued by the Government at 133% more than one found to have a speed of 36 miles per hour. As safety is also a desideratum, and depends at present upon the use of large areas which tend to limit the speed, the wisdom of specifying such high velocity in the early stages of this art is open to question.

The specified method of determining the speed is theoretically incorrect, because it is based upon an erroneous method of obtaining an average. Let us suppose that an estimate has been accepted and that the inventor has completed his machine and can fly five miles in seven and a half minutes or at the rate of forty miles an hour in still air. Let us suppose that the Government trial is held in a twenty-mile wind, which is very common in our latitude. Let us suppose that the machine is sent over a measured course of five miles against the wind and returns with it. The flying machine would require 15 minutes to cover the distance one way and five minutes to return. The average time would be 10 minutes for five miles and give an apparent speed of 30 miles per hour, the machine being rejected.

According to the specifications the bidder would lose his bond equal in amount to the accepted estimate, and probably also lose the cost of the rejected machine in spite of the

fact that it did actually fly through the air at the rate of 40 miles an hour, and all this on account of an incorrect system of measurement. To show a speed of 40 miles an hour against and with a 20-mile wind when measured as proposed would require a speed of nearly 48 miles an hour through the air.

The absolute incorrectness of the specified method of determining the speed is apparent.

The specified test is also entirely unfair from a business standpoint. The test is to be "subject to such additional details as the Chief Signal Officer of the Army may prescribe at the time." This objectionable clause could be paraphrased to read, "Subject to rejection if preferred by the Chief Signal Officer."

To reject the machine the officer would merely have to decide to try it in a high wind or during a dying wind or at an upward angle, or over a long course, or around sharp turns, or over hilly country, or during a rainstorm, or after a slight accident, etc. To favor the acceptance of the machine on the other hand it might be tried on a comparatively calm day, or during a freshening wind or starting from a point higher than the finish, etc.

If the machine under test is to cost $100,000 for a 40-mile speed and is actually capable of 45 miles per hour under favorable conditions, it is optional with the Signal Officer to have the bidder receive $140,000 for it, or $60,000 or any intermediate sum, or nothing at all, ,simply by deciding to test it in some particular intensity of wind or under some special conditions.

I do not for a moment doubt the absolute integrity and good will of our Chief Signal Officer, although I have not the pleasure of knowing him personally, and do not suppose that any of the eventual bidders know him very well. This in itself constitutes the objectionable clause, as an inventor cannot properly estimate in advance on satisfying the requirements of a test to be later determined by an unknown arbiter invested with autocratic authority.

As a better method the time ought to be taken over a measured course against the wind and returning with it. The speed over the ground could readily be computed for each direction, and the speed through the air would be the average of these two figures.

Let us suppose a machine to cover a five-mile course in 15 minutes in one direction and in five minutes in the other. The speed over the ground would then be 20 miles per hour one way and 60 the other, the average or true speed through the air being 40 miles per hour. If we should take the average of the time we should obtain a false result of 30 miles per hour.

As the wind in all flying devices blows squarely from the front, a popular misconception to the contrary notwithstanding, another way to measure the speed would be, by the use of an anemometer, previously calibrated for small errors by testing it on an automobile or train. The inaccuracy due to the flying machine swerving from its course would be very small, being about 1 per cent. for variations of 10 degrees on either side of the course. The small corrections to be deducted for this error could be computed with sufficient correctness by observers on the ground.

A third way would be to make the speed tests on a particularly calm day, using either of the other two methods of allowing for the slight wind effect, and then hold an entirely separate test for dirigibility on some windy day. This method would have the special advantage of practically eliminating the errors due to variation in the intensity and direction of the wind which would otherwise be considerable. I hope that these suggestions will arouse sufficient interest to lead to the adoption of a rational method of determining the speed of flying devices.

[This article was received too late for proof to be submitted to author.—Ed.]

THE NEW "BAYARD" AIRSHIP.

The "Bayard" airship is a novel form which M. Clement, the well-known automobile constructor of Paris, is now engaged in building according to the designs of the aeronaut Capazza. What is new about the form of the balloon is that the upper and lower halves are each conical, the bases of the two cones forming the horizontal median line of the gas bag. When once in the air, this balloon will travel forward and downward on its lower cone somewhat after the manner of an aeroplane. The design was drawn up some years ago by M. Capazza, but he could not have it carried out from lack of funds. An envelope of rubber-coated tissue is to be used, having the double cone form, with a width of 138 feet and a maximum height of 23 feet. The total volume of the balloon is figured at 178,373 cubic feet. On the framework there are to be two propellers, each driven by a Bayard-Clement motor of the usual automobile type. It is designed to carry five aeronauts on board, together with over a ton of ballast, and to be able to remain for ten or twelve hours in the air. A well-developed system of planes will be added to the balloon. The profiles of the balloons are specially designed so as to transform the ascending or descending movements into a sliding movement or lateral displacement, and this gives the system an aeroplane action to some extent.

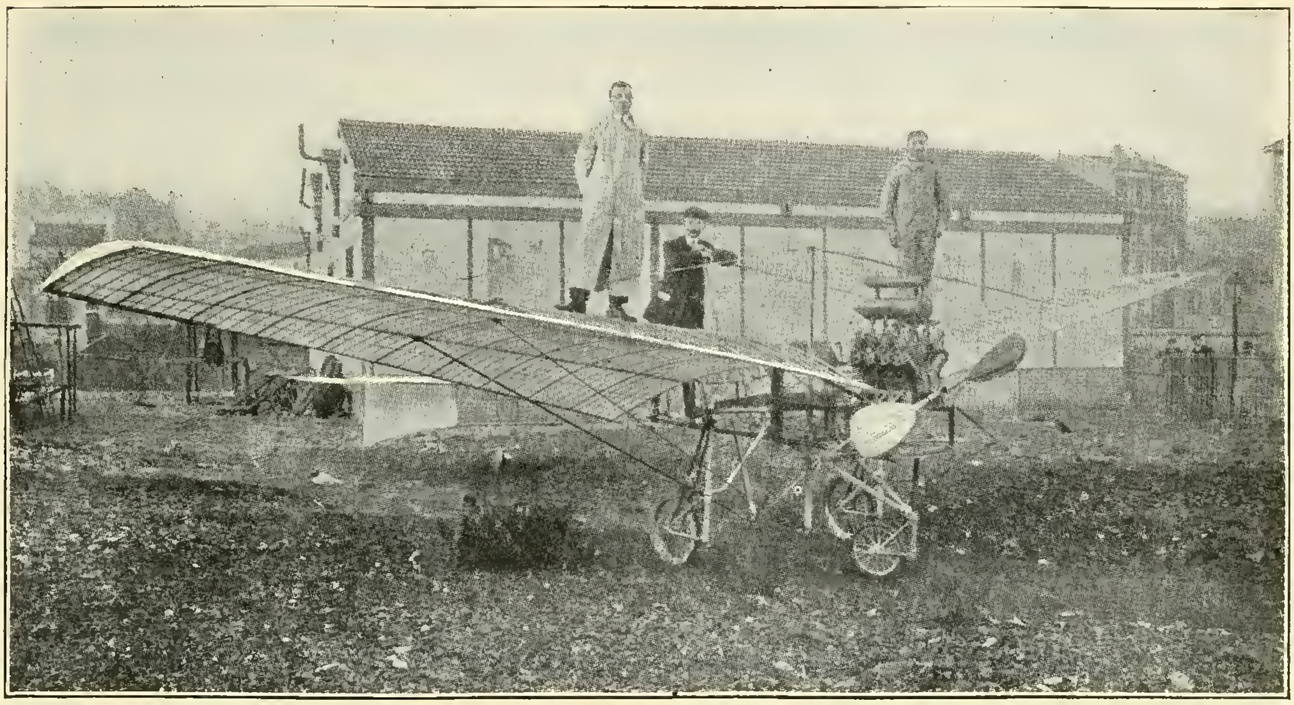
THE NEW MONOPLANE OF GASTAMBIDE AND MENGIN.

By M. Mengin.

The construction of an aeroplane by M. Robert Gastambide and myself, announced some time ago, has now been completed.

We are partisans with MM. Santos-Dumont and Bleriot in the type of machine, monoplane, and have decided upon that type.

The wings have a total spread of 10 meters and are attached to the body by a system of grooves which makes them easily detachable. They are held, on the other hand, to this same body by a new and original system of girders which are made up of thin sheets of steel which offer, in addition to less resistance to the air, greater solidity than those means heretofore employed. The chassis is fitted with wheels having a certain amount of play longitudinally and transversely, designed especially to minimize the shock of landing. The body of the apparatus, which is 5 meters long, carries in front a 50 h.p. 8 cyl. Antoinette motor, with one propeller mounted in front



THE GASTAMBIDE-MENGIN MONOPLANE.

directly on the shaft. In the middle of the "cage" sits the aviator and at the extreme rear there is a tail for stability, serving as the sole means of governing the direction.

After a number of trials with small models we have thought it would be sufficient to give the apparatus an invariable angle of resistance and to rely only on the mobility of the 8 cylinder motor to modify the speed of the machine and, consequently, the form of its trajectory. We have thus abolished totally any governor for raising and lowering.

The total weight of the aeroplane will not exceed 400 kilograms. Trials of the propeller on the motor, made on the block of special construction, we found that we can easily count on 140 kilograms thrust and we think we ought to bring the speed up to 55 kilometers an hour.

After a well deserved rest we will begin trials with the apparatus. The apparatus was put on its feet in less than three weeks.

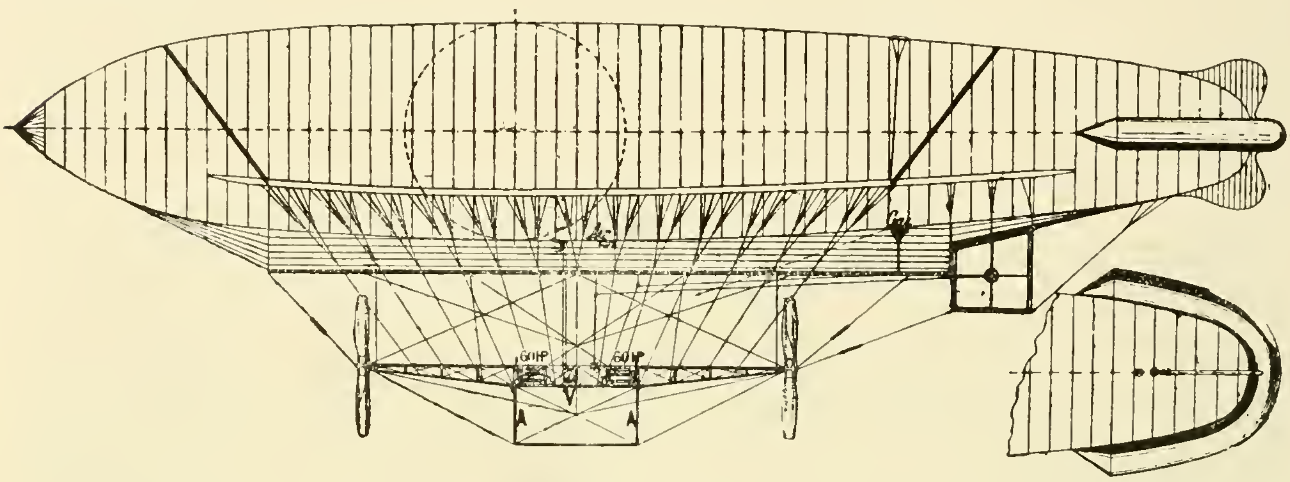
[The screw has a diameter of 2 meters, 1.3 meters pitch. Total surface is 24 square meters.—Ed.]

MILITARY DIRIGIBLE FOR THE BELGIAN GOVERNMENT.

The Belgian Government is considering the question of the construction of a dirigible, to be constructed by Louis Godard.

Principal dimensions: balloon 60 metres in length; diameter 10.6; circumference, 33.284; surface, 1900; cubic capacity, 3750 metres; ascensional force, 4125 kilograms; speed per hour, in calm air, (2 propellers) 50 to 55 kilometres; with 1 propeller, 35 to 40 kilometres; motor power, at 900 r.p.m., 120 h.p.; diameter of the propellers, 7 metres; r.p.m. 225; speed at the periphery per second, 80 metres; length of the keel, 33 meters; length of the car, 1.5 metre; delivery of the fan, 3500 cubic metres; motor "l'actionnant" 6 horsepower

Weights: rubber cloth balloon, 700 kilograms; balloonet of 1/6th the total cube, valve rope, "enpennages," "ralingue," vertical stem, suspension, rigging and rudder, 540; car, 350; 2 motors, 480; 2 propellers, 150; flywheels, shafts, radiators, connections and movements, supports, oil, water, gasoline, pipe system, 245; fan and its motor, 40 kil.; counterweights, means of equilibrium, instruments, &c, 245; possible deviations, 135; gasoline for 10 hours, 360; water, 30; 5 persons in the car, 400; ballast 45; total 4125 kilograms.



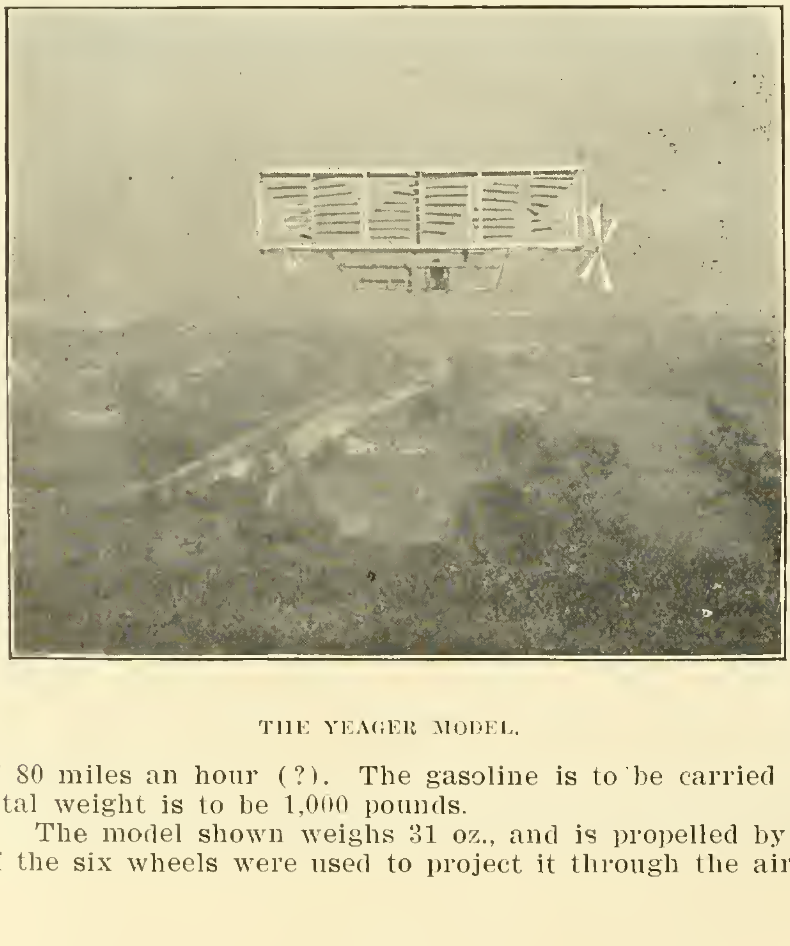
1907 GODDARD.

The engineer, Louis Godard, prefers to employ two motors of 60 h.p. each with two propellers turning in opposite directions. In the event of damage to a propeller or a motor it is expected to be able to return to the start with one motor and one propeller at a speed of 30 to 40 kilometers per hour.

THE YEAGER FLYING MODEL.

S. Yeager, of Pittsburg, has designed a novel aeroplane (or helicopter?), of which a model is illustrated below.

There are to be 60 planes, containing 660 square feet of surface, made of No. 20 aluminum alloy, revolving on a vertical shaft. One-half the planes travel from left to right and the other half from right to left. The framework measures 45x14x12 feet, with a 4x16x7-foot car underneath. There are six of the vertical series of blades, or wheels, each 12.5 in diameter. Two 15 h.p. Curtiss motors will furnish the power; one engine driving the four outer wheels, and the other engine the two inner wheels and the twin propeller, which will be placed forward. The four corner wheels are expected to run at a speed of 600 r. p. m., the two middle wheels being started first in rising. Soon after leaving the ground the propeller will be set in motion. The inventor claims that a square foot of the surface in his machine will lift six pounds, and travel at a rate of 80 miles an hour (?). The gasoline is to be carried in the hollow framework. The total weight is to be 1,000 pounds.



THE YEAGER MODEL.

The model shown weighs 31 oz., and is propelled by rubber band power. Only four of the six wheels were used to project it through the air against a slight breeze.

NOTES.

January 16th, Charles J. Glidden sailed for Egypt, taking his motor with him. A. Leo Stevens and A. Holland Forbes saw him off. Mr. Glidden was furnished with four small balloons, two of which were to be released as the boat left and two at sea. As the ship pulled out, Mr. Glidden let the two balloons go. This was a signal for the release of 175 others arranged at the end of the pier by Messrs. Stevens and Forbes. The sight was a pretty one and made a sensation.

"The airship is the coming thing," said Mr. Glidden just before sailing. "I have in mind a trip from Fort Omaha to Boston, a distance of 1,800 miles," said Mr. Glidden. "Leo Stevens has my order for the balloon, which will be of medium size, being of but 38,000 cubic feet capacity. Once this journey has been accomplished I shall endeavor to win some of the trophies offered around Boston. We have five to try for. These include a trophy to the aeronaut who starts at least 150 miles from Mount Washington and lands within a mile of Mount Washington hotel, offered by Mr. John A. Anderson, another like trophy for the aeronaut who starts a like distance away and lands within two miles of the Poland Springs hotel at Poland Springs, Maine; a third trophy to the aeronaut landing on Boston commons after starting 100 miles away, offered by the Boston Herald, and two trophies offered by the North Adams Herald, one for balloons starting from North Adams and landing within five miles of Boston common, and the second for the greatest distance covered starting from North Adams. All of these will be handsome trophies, and Bostonians are preparing to compete for them this year."

The Aero Club dinner at the St. Regis is postponed until March 14.

Acting on the complaint of several hundred stockholders, federal officers have started an investigation of the National Airship Company, San Francisco, and the first result of the investigation has been the disappearance of all the officials connected with the concern and with them what is left of stock sales amounting to more than quarter of a million dollars. The company was promoted to secure $1,000,000 with which to build an airship that would be the greatest thing ever imagined. More than 250,000 shares of stock were sold. It claimed that the intention was to construct an airship 1,250 feet long, 64 feet in diameter, of 140,000 cubic yards capacity and 128 tons displacement, with eight independent power plants, and engines developing 3280 horsepower turning 16 propellers. Forty men, as advertised, were to compose the crew, and the airship to carry 500 passengers and 40 tons of mail from New York to London at an expense of $875 in 24 hours, "every day in the year, regardless of weather conditions." Regular trips were advertised between Portland and San Francisco.

Many other claims of future accomplishment taxing the power of credulity to the breaking point were made in the matter, which is said to have gone through the mails. The company advertised, further, that it would issue checks in payment of dividends January 1, 1908, but this is said not to have been done.

The German government is constructing an automobile, armored, of high speed, carrying a rapid fire gun capable of firing at an angle of 70° to the horizontal, to be used as an "airship destroyer."

Here is a comparatively small country like Germany far ahead of the United States in its aeronautical arrangements for defense and yet we apparently are doing little or nothing in this line. Paying millions of young 1907 widows of old 1865 veterans, it might be well to devote a few thousand to aeronautics, offensive and defensive.

The Aero Club of Great Britain is in communication with the most successful aeroplane inventors, both in England and abroad, with a view of bringing them together upon a given day to demonstrate by practical flights their prowess in the air. It is suggested that the Brooklands motor track or the grounds at Hurlingham shall be the scene of the great event. Already the promised awards for long flights and short flights amount to over $150,000. It is hoped that Mr. Henry Farman, who has achieved so many wonderful flights in Paris, may be persuaded to cross the Channel and demonstrate how near he is to a practical solution of the problem of the air. The "international aspect" of the trials will be provided by the determination of Mr. A. V. Roe, the English inventor, to take part in the contest. He is actively engaged upon the Brooklands motor track, putting finishing touches to the steering apparatus of his large, man-carrying machine, with which he proposes to make an experimental flight.

"La Patrie" and "La Ville de Paris" made 42 and 28 ascensions respectively during 1907.

Mount Weather Observatory has begun the publication of a bulletin, to be issued quarterly. The first number is most creditable. "Our Origin and Purpose" of the Bu-

reau is treated by Willis L. Moore, Chief U. S. Weather Bureau; "The Methods and Apparatus," by Dr. W. R. Blair, and "The Use of Upper Air Data in Forecasting," by Prof. A. J. Henry. Records of all kite flights and captive balloon ascents during the year are given, together with a number of fine illustrations.

A writer states that he examined the envelope of a balloon which burst at the International Exhibition at Milan in 1906. A number of spots were visible on the envelope, and at these places the material could be easily torn, whereas at other parts it showed great resistance to tearing. These spots were found to have been caused by phosphoric and arsenic acids, produced by oxidation from arseniuretted and phosphoretted hydrogen contained in the hydrogen gas. The presence of these impurities is due to the use of impure materials in the preparation of the hydrogen, and the author recommends that the preparation of the gas for filling balloons should be under strict chemical control.—*Engineer.*

Attempts to beat the World's distance record and win at the same time, the Lahm cup will be made during 1908 by A. Leo Stevens and Charles J. Glidden, the start to be made at some point west of the Mississippi. Omaha has been considered by Mr. Glidden but coal gas cannot be obtained there. Denver will next be investigated.

Carl E. Myers has sold from his "balloon farm" at Frankfort the little dirigible "No. 23" to people in Seattle for exhibition purposes.

Major Baden-Powell, states that for several months past he has been experimenting with kites and models of aeroplanes. These experiments were purely of a private character and in no way connected with the War Office. Satisfactory results, he said, had already been accomplished, although he had obtained nothing conclusive, owing to the size of the models. The first experiment was carried out with models fitted to a 12-horse-power engine, the whole machine weighing under seventy pounds. Later on, an engine of double the power was secured, and the result was "extremely satisfactory." With an engine of a more perfect design, Major Baden-Powell hopes to be able to build, early in the new year, a model capable of lifting and carrying the weight of a man.

In view of the rapid progress of various forms of ballooning in France, M. Paul Fauchille, the Director of the Revue Generale de Droit International Public," has drawn up a series of thirty-two articles as the basis of an aerial code to be adopted by the various European powers.

The articles provide for the creation of an aerial customs organization, and it is suggested that in time of peace, as well as during hostilities, aeronauts should agree to respect certain portions of the atmosphere. They should for instance, undertake not to approach nearer than 4,500 feet above forbidden territory, such as barracks, forts, and encampments. In this way all "indiscretions" which might result from the use of cameras would be avoided.

M. Fauchille's articles will be discussed at Florence during this year, and, when the time is ripe for the drawing up of an international aerial code, the French Ministers of War, Marine, the Interior and Finance will nominate commissions composed of jurisconsults and technicians to frame the rules which they may consider advisable.

The principle of the liberty of the air must be maintained, says M. Fauchille, but with certain reservations affecting the repression of espionage, customs, sanitary policing and the necessities of national defense.

The coming aeronautical congress at Florence is expected to settle the thorny question of the role which dirigibles will play in the wars of the future, for it is now recognized that the airship is likely to become a redoubtable engine of combat.

Two more balloons have been sold from the Stevens shop: one of 1,600 cubic metres to A. H. Forbes and one of 1,100 metres to Charles J. Glidden.

The price of subscription to the *Aerophile*, the official organ of the Aero Club de France, has been advanced to 18 francs instead of 12, as heretofore. It will now be issued semi-monthly, on the 1st and the 15th.

Count Zeppelin has started the construction of a new airship which he is building for the German government. The dimensions of this new airship are given as follows: Length, 130 meters (426½ feet); diameter, 12 meters (39 1-3 feet); horsepower, 240, consisting of two Daimler motors of 120 horsepower each, which will be used instead of the two 85 horsepower motors with which the present airship is equipped. The new airship is being constructed in a shed mounted on floats at Manzell on Lake Constance. It is the fourth airship that Count Zeppelin has built.

A syndicate is being formed in Hong-kong to build an airship designed in 1894

by a Chinaman, Tse Tsan Tai. It is to be built of aluminum, and will be enclosed in an aluminum shell to protect it from the enemy's projectiles. The envelope is to be cigar-shaped. Tse Tsan Tai's principle is that airships should depend upon their fan-propellers for advancing, receding, ascending and descending. The gas-envelope is to be used only as a buoy. For the vertical movement, therefore, there are to be horizontal propellers on the deck regulated by clockwork. The steering will not be by exposed planes and rudders, but by concealed steel wings, which can be thrown out at the stern on the pressure of an electric button.

It is reported that the aeroplane which has been in course of construction in great secrecy, under the supervision of the English military, was tried out and found wanting. A new aeroplane will be tested at Farnborough. The Automotor Journal states: "The machine is of the double-decked type, and possesses a horizontal deflector in front and a vertical rudder behind. The over-all width of the double-decked plane is about 100 feet, and the height between decks about 10 feet. The extremities of the decks are joined by side curtains so as to convert the structure into a massive oblong box kite."

A horse named "Airship" won first money at 10 to 1 in New Orleans during January.

Captain Chas. De F. Chandler was detailed the first of January to deliver lectures in aeronautics to the balloon corps at Forts Omaha and Leavenworth.

The secretary of the new *Aeronautique* club of Chicago is an undertaker, and he is accused of joining the organization for mercenary reasons.

There has been organized in Milan the Fabbrica Italiana Aereostati, with a capital of $25,000, for the construction and operation of dirigible airships. A series of experiments is proposed for the purpose of developing the value of the company's dirigible, which is known as the Frassinetti type.

Ever since the catastrophe at the Crystal Palace, work has been pushed forward on the repair of the Nulli Secundus, which is now once more in a condition to take the air. Profiting by past experience a more powerful motor is to be installed but at the present moment this has not yet arrived from France.

The vice-president of the Aero Club of France has offered a prize of 100 francs for the best device rendering the car of balloons unsinkable.

The "Aeronautical Supply Co." has been started by Messrs. Tappmeyer and Horn at 823 Overton St., Newport, Ky.

J. W. Roshon, whose aeroplane was described in this magazine has entered into business to supply flying machine material and supplies, at Harrisburg, Penna.

A fatherly interest is being taken in German inventors of aeronautical machines by the Berlin Aeronautical Society and the Automobile Technical Association, who have combined forces with a view of encouraging and assisting inventors to perfect their designs. A large open space has been obtained in the suburb of Konigswusterhausen as a testing ground and here trials will be made under the superintendence of Prof. Süring, a well-known meteorologist and balloonist. At first, experiments are to be confined to models of the Lilienthal type of machine.

In speaking of the Government specifications for a dirigible balloon, Mr. Carl E. Myers of the "balloon farm" at Frankfort, N. Y., stated:

"My purpose in airship work is to retain during a voyage all the gas I start with, in the smallest bag practicable, of suitable form for least resistance both fore and aft, and carrying a boat keel and car light, and compact for transportation, actuated by lightest motor suitable, and controlled in satisfactory equilibrium by the aeronaut within his car without movement outside of it.

"I believe these features must form the basis of any substantial advance in aerial navigation by gas bags, and that the matter of increased speed is simply a matter of increase in dimensions on this system.

"My bid for Government airships embodies these features and some others not yet disclosed, and of which the aeronautic world has yet no apparent conception. The gas-proof fabric which the Government proposed at first to supply is exactly such as I have been producing commercially for some time by patent machinery. The only change in the later revised specifications for which bids are invited is that bidders shall supply their own gas-proof fabrics, not requiring further varnishing.

"My 'No. 23' airship, lately sold to Seattle (Wash.) parties, consists of a symmetrical

gas spindle, capacious amidship, with sharp prow and stern, of 7,500 cu. ft. capacity, packing within its car, 23 x 23 x 33 inches, which also contains a 7-horsepower, 2-cylinder, 2-cycle, air-cooled gasolene motor with all appurtenances in place for immediate operation. This car in turn packs within a common trunk for shipment. A boat frame 36 ft. long, 23-inch triangular section of 36 lbs. weight, separates into 4 complete sections, which telescope within the largest one 9 ft. long for shipment, with all machinery, propeller and steering aeroplanes, for immediate junction with the central car for use in a few minutes. The motor drives a twin blade propeller 4 ft. diameter of 3 lbs. weight, at 2,250 r. p. m., exerting a thrust of 60 lbs., either forward or backward. My facilities have reached such a point as to enable me to build and sell such a craft, complete with patent, portable gas generators for inflation, at $1,300, as a commercial runabout for one person and baggage, for sport, transport or exhibit."

THE VILLE DE PARIS AT VERDUN.

The dirigible Ville de Paris, has succeeded in sailing from Paris to Verdun. The first trip was attempted three weeks ago, but was stopped by high, adverse winds.

The delay in making the second start was caused by the anxiety of the military authorities to avoid any unnecessary risk. Meteorologists promising a favorable wind that was likely to hold, the start was made from Paris at 9:47 A. M. Commandant Bottieax, Pilot Kapferer and Mechanician Paulhan formed the crew.

At Coulommiers Kapferer sent down a note, weighted with lead, saying that all was well and that the balloon was going eighteen miles an hour. At Montmirail another note was sent down, asking the automobiles that were following to turn on their searchlights, as an aid to piloting.

At 4:30 o'clock it became evident that the balloon's engines were not working and it returned to Valmy and landed. It was found that a pipe was broken, and an hour was required to mend it. Though it was now dark Bottieax decided to continue the journey, saying he would follow the motors' lights. As a matter of fact, he led the way, and he reached Verdun and the balloon was safely housed by 7:05 o'clock; after a trip of 155 miles. The time was 8 hours and 18 minutes, deducting for the stop and for maneuvers of landing.

La Patrie made the trip in 7 hours 5 minutes. Since the wrecking of La Patrie the Ville de Paris is intended to take its place in the French army experiments.

A MACHINE FOR VARNISHING BALLOON CLOTH.

Machinery is now to take the place of hand work in the varnishing of balloon cloth and to do in two or three days more and better work than usually takes five or six weeks. Leo Stevens has acquired the exclusive privilege for this machine, which will varnish and dry 2,000 yards of cloth an hour. After a repetition of the process seven times the cloth ought to be hydrogen proof. Of course, after the cloth is cut and sewed together the seams will have to be gone over again by hand, but the bulk of the work has been done. The weight of the machine is about 2½ tons.

Mr. Stevens also expects to have a machine to make nets. It is expected that the machine will tie three nets a day, whereas it takes 45 or 50 days to make one by hand.

NEW LIGHT MOTOR.

The new light water cooled motor of the Aero & Marine Motor Co., shown at the last Aero Show, has been tested out and developed 44 horsepower, brake test. The motor is rated at 40 horsepower. The weight is 130 pounds, and this includes the magneto, oil cups, water, etc., all except gasoline tank. The weight per horsepower thus figures 2.95 pounds.

ITALIAN DIRIGIBLE.

The Italian military airship is expected to be completed in another month or six weeks. The mechanical part is being built from a hydroplane which has made 80 kilometers an hour on trials over Lake de Bracciano, near Rome. The work is being conducted under the supervision of two distinguished technicians, Messrs. A. Crocco and Ricaldoni of the special aeronautical brigade. The bag is expected to be ready within the month.

JUNIOR AERO CLUB.

The Junior Aero Club of the United States is being organized under the directorship of various members of the Aero Club of America. Messrs. Lee S. Burridge, Thomas S. Baldwin, Wilbur R. Kimball, A. Leo Stevens, and Ernest L. Jones are on the Advisory Board. Its headquarters will be at 131 West 23d St., New York.

The objects as set forth in the constitution are: to promote interest in and encourage the study of ærial science among young people and to hold exhibitions and contests of apparatus designed for the purpose of ærial locomotion, voluntary or involuntary, made or owned by its active members. It is not intended to limit the scope of the organization, however, as it is proposed to include the subjects of wireless telegraphy, telephony, etc., as applied to the art of æronautics.

It is the intention to hold club, national and, perhaps, international contests at such dates as may be possible. The first is expected to be held on May 30, being a national event. A contest for distance is planned between small "pilot" balloons, starting from a convenient location near New York, probably. These will be filled with hydrogen and will carry notes asking the finders to return same to the club. Several prizes will be offered for the balloon making the greatest distance, the one having the most ingenious arrangement for disposal of ballast during flight, etc.

The contest is open to all members of the club, wherever they may be. The fact that they propose to compete, however, must be recorded in advance at the New York headquarters.

At a contest in Paris conducted by the "Auto," during 1907, more than 300 balloons were liberated, the winner travelling from Paris to Runsten, Sweden, about 840 miles,—exceeding the distance from New York to Chicago,—and breaking prior record of balloon flights made in 1901, of 750 miles, when balloon descended in Prussia. The balloons entered in this contest varied in size from the small balloons such as are sold for a few pennies on the street to those three feet in diameter. The larger ones were made of goldbeater's skin with net such as used on large balloons, to which a tiny car weighing but an ounce or two was attached. The boys "showed great ingenuity in supplying their miniature balloons with ballast. Some had a box of flour hanging from the balloon, which a small valve allowed to escape as it rose, another had a lump of ice in a box which lightened the balloon by gradually melting, while yet a third had a long tail of inflammable matter to which was attached at intervals little pieces of lead. This was set on fire as the balloon was sent off, and as it burned, the pieces of lead dropped one by one, thereby lightening the balloon." A card is always fastened to the balloon bearing the name of the owner, with request to return balloon or card to a specified address.

These contests would be of particular value to the Weather Bureau were the balloons fitted with registering instruments. Meteorological stations abroad are continually sending up numbers of these small balloons for the purpose of securing meteorological data. A great deal of this work has been done by the Blue Hill Meteorological Observatory, of which Professor A. Lawrence Rotch is the head. It is hoped to consummate some arrangement by which the results obtained may be utilized by the Weather Bureau, and to work with the Bureau in obtaining data.

A "Junior Aero Club" member, Percy W. Pierce, in his workshop. The young man is constructing a model dirigible. The bag will be 4½ feet long by 18 inches in diameter of goldbeaters skin.

Membership in the club is divided into three classes:

(a) Honorary; (b) Active members who construct their own apparatus; (c) Active members who own apparatus not constructed by themselves.

No person shall be eligible for active membership who is more than 21 years of age.

Branches of ten or more members may be formed anywhere in the United States.

If it is found that interest warrants it, talks on scientific subjects may be given by members of various scientific organizations. Debates may be held by mem-

bers of the club and papers prepared by them.

Arrangements are being made for the manufacture of a specially designed balloon to be for sale at prices varying according to the size, fifteen cents to several dollars It is planned to furnish from headquarters, patterns, material and directions for making balloons, at most moderate cost.

It is believed that there are at the present time many young men and boys interested in scientific subjects who have the true inventive faculty and, in their own way, are doing impoitant work, and that these young students and experimenters should be encour ged and such assistance afforded them as may be derived from an organization stimulating interchange of ideas. Advice will be given by experienced constructors and serious efforts made to direct the members' efforts along right lines.

America already has a number of boys who have achieved actual results in their experiments in æronautic science. It is contemplated to hold an exhibition of everything relating to this subject on May 30th, 1908, at the time of the contest.

The club is being organized by Miss E L. Todd. who, it has been stated is the only woman in the world who has designed and made working models of æroplanes.

AERONAUTICS IN THE CURRENT MAGAZINES.

McClure's for February has a most interesting article on the Wright Brothers, by George Kibbe Turner. Mr. Turner visited the Wrights at Dayton, early in 1907 and secured the story of the development of the Wright flyer at first hand. Though the wording is not exactly that of the Wrights, the story is written as told by them. They tell of the starting of their work, the trouble experienced by the "turbulence of the air," the problem of equilibrium, the first successful flying machine in 1903, the trouble in turning corners, the absence of danger from the stopping of the engine, the uses of the aeroplane, the speed, the discovery of the principles of the screw propeller, the simplicity of learning to fly an aeroplane, etc.

We quote: "The eventual speed of the aeroplane will be easily 60 miles an hour. It will probably be forced up to 100 miles. Our last machine showed 40 miles, and the one we are building now will go considerably faster. At speeds above 60 miles an hour the resistance of the air to the machine will make travel much more expensive of power. Our experiments have shown that a flyer designed to carry an aggregate of 745 pounds at 20 miles an hour would require only 8 horsepower, and at 30 miles an hour, 12 horsepower. At 60 miles, 24 would be needed, and at 120 miles, 60 or 75 horsepower. ***** Our 1907 machine will carry gasoline enough to fly 500 miles at a rate of some 50 miles an hour. We can, and possibly soon will, make a one-man machine carrying gasoline enough to go 1000 miles at 40 miles an hour. Moreover, any machine made to move at speeds up to 60 miles an hour can be operated economically at a cost of not much more than one cent a mile for gasoline.********** Besides inventing a practical flying machine we claim to have discovered for the first time the method of calculating in advance, the exact efficiency of screw-propellers, which will save the great waste involved in the present practice, by which screws must be made and tested before their efficiency can be accurately learned. This method of ours has been tested in the manufacture of our aeroplanes; our screws were made with only a slight margin of power over what was demanded by our flyer, and they have invariably proved successful."

"We say frankly that we hope to obtain an ample financial return from our invention but we care especially for some recognition as scientists, and, whenever it becomes possible, we propose to bring out the results of our investigations in a scientific work upon the principles of aerial navigation."

Scribner's for February opens with a most original and romantic story by Frederick Palmer, the war correspondent, entitled "For the Honor of the Balloon Corps." The situation is entirely possible under impending conditions of warfare. The hero of the exploit is a genius and an officer of mettle. It is vividly illustrated by Wyeth.

A recent cable message from Berlin is a singularly apt and timely commentary on Mr. Palmer's fine story, "For the Honor of the Balloon Corps," which appears in this number.

"The artillery branch of the German Army is carrying out a series of interesting experiments at Juterbog, the fire of field guns being directed upon captive steerable airships. The results of the experiments are being kept secret.

"The navy already has had considerable practice in firing upon captive spherical balloons towed by torpedo-boat destroyers, the targets being moved quickly in every direction, giving the impression of balloons manœuvring in the air."

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GREATEST POWER, LEAST WEIGHT CONSISTENT WITH RELIABILITY.

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3½	H. P. single cylinder air cooled, "	35 "	40	H. P. 8-cylinder air cooled V. "	160 "
7	H. P. 2-cylinder V air cooled, "	50 "	50	H. P. 4-cylinder water cooled, "	200 "
15	H. P. 4-cylinder vertical air cooled, "	100 "	100	H. P. 8-cylinder water cooled, "	300 "
20	H. P. 4-cylinder vertical air cooled, "	110 "			

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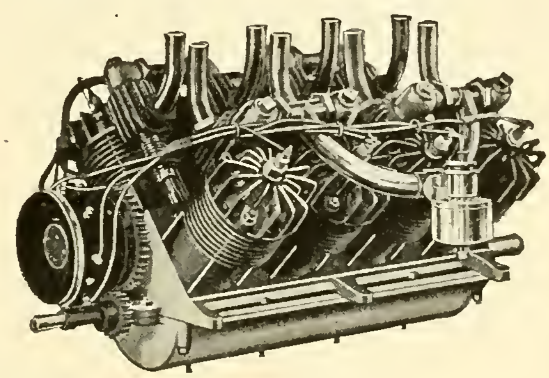

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The Mount Pleasant and The Mount Washington.

ANDERSON and PRICE, the Landlords

offer you a great Solid Silver Cup to fill from the crystal waters of the mountain springs and from which to drink your own good health which comes to all who drink the pure waters of Bretton Woods.

ASK AERONAUTICS.

TO AN EXPECTANT BUT DOUBTING WORLD.

I opine that you will not believe it, but it is a fact nevertheless, that I, Me, Myself, the undersigned, is the creator of an aerial craft that is radically different in principle and construction from anything heretofore conceived by experimentors in both schools of aeronautics. No philosophizing but a practical and demonstrated fact.

I have at different times and on various lines, tried to raise a whirlwind by interesting unsophisticated private parties and have failed of even a zephyr.

I have even gone so far as to communicate with four different governments. including our dear old Uncle Sam, believing in my childlike innocence that the said governments were groping in the dark trying to locate something practical in the aeronautical line but am sorry in having to affirm that they were all "from Missouri," and in persistently believing that the problem will be solved on the lines as followed by the different schools of aeronautics at the present time, not perceiving in their blindness that practical and successful aeronautics are impossible of accomplishment and fundamentally wrong on the lines followed by all experimentors.

Now I am perfectly willing to show all the Missourians that I have the only practical aerial craft in existence. And bear in mind, all ye Missourians, that you are not dealing with an over-night dream but with the cogitations and experiments of years.

So now is the time and opportunity to transfer yourself at small cost, to the Nacelle of this successful and swiftly moving craft and wallow in the glory of being connected with its mast-head.

All that is needed is a few double eagles to construct a demonstrator of aluminum and to acquire the patents in this and other countries.

Now if there are any confiding Missourians running around loose with a little coin that they are willing to sink in such a visionary scheme as a practical aerial craft, just deposit the coin in the bank, Mr. Missouri, subject to the order of the president of the bank, to be used by him solely in paying the bills for material as it is required, and to pay the cost of the patents. And to inspire any would-be nibbler with sufficient confidence to perform this feat of deposit, I will show him my model, which will elucidate, in all of its ramifications, the wonderful simplicity of construction and operation of this wonderfully practical and successful aerial craft.

Practical and successful through actual demonstration with a full sized craft made of cheap material, which had unfortunately to be destroyed by myself, rather than have the principle on which it operates discovered by other parties. Not, however, before having demonstrated beyond the peradventure of a doubt that the principle employed is the only practical solution to successful aerial navigation.

Let this sink deep into your gray matter, Mr. Missouri, that I am making this magnificent proposal solely because I appreciate the fact that at my present acceleration in high finance, I will probably in the next five years augment the condition of my exchequer to the tune of 30 cents.

Should this effusion by some miracle coincide with your jaded appetite as to wish to consume some more, communicate with me, and I will come again to the further assimilative assistance of your alimentation and to clinch the matter, Mr. Miller from Missouri, you will appoint one expert in aeronautics and the editor of some journal interested in aeronautics will appoint another and I will appoint one. which will make three experts in aeronautics, to act as judges to decide whether the principle elucidated in my model is practical. If two out of the three decide that the principle is practical the money on deposit will stick to the bank, but if by some unfortunate turn of the stars two out of the three experts should denounce the principle employed as the irrational conception of an erratic and bombastical crank, your deposit of ungainly buzzards in overalls, who do not trust in God, will be returned to you, Mr. Missouri.

Aeronautically yours,

Box 305, San Jose, California. JOS HENAULT.

AERONAUTIC BOOKS FOR SALE.

This magazine will publish each month a list of such rare and contemporaneous books relating to aeronautics as it is able to secure. If you desire any of those listed, kindly send check with your order for the amount stated. Should the book ordered be sold previous to the receipt of your order, the money will be promptly returned.

Astra Castra: Experiments and Adventures in the Atmosphere (Hatton Turner). Illustrated. Royal 4to, cloth, 1865. Extremely rare........................ $15.00
History and Practice of Aeronautics (John Wise). Illustrated. 8vo., cloth, Phila., 1850. Very rare........................ 15.00
Travels in The Air (James Glaisher). Illustrated. 8vo., cloth, London, 1871...... 10.00
Flying and No Failure, or Aerial Transit Accomplished More than a Century Ago. (Rev. Ralph Morris). Very rare reprint on Private Press of London, 1751.. 3.00
My Airships (Santos Dumont). Illustrated. Crown 8vo., cloth.................. 1.40
Travels in Space (Valentine and Tomlinson). Introduction by Sir Hiram Maxim. 61 plates, 8vo., cloth, London. 1902........................ 2.00
Conquest of the Air (John Alexander). 12mo., cloth, London, 1902................ 2.00
The Dominion of the Air (J. M. Bacon). Story of aerial navigation. Illustrated. Crown, 8vo., cloth, London, n. d........................ 2.50
Resistance of Air and the Question of Flying (Arnold Samuelson). Illustrated. 12mo., 42 pp., paper........................ .85
Flight Velocity (Arnold Samuelson). Illustrated. 45 pp., 12mo., paper............ .85
Flying Machines, Past, Present and Future (A. W. Marshall and H. Greenly). Illustrated........................ .60
Paradoxes of Nature and Science (W. Hampson). Illustrated. Two chapters on balloons as airships and bird flight. 8vo., cloth, N. Y., 1907.................. 1.50
Aerial Navigation (Van Salberda). Translated from the Dutch by Geo. E. Waring, Jr. Illustrated........................ .60
By Land and Sky (J. M. Bacon). Illustrated. 8vo., cloth, London, 1900.......... 2.50
A Balloon Ascension at Midnight (G. E. Hall). Illustrated in color. Limited edition published. Very rare. 8vo., paper, San Francisco, 1902................ 2.50
Andree's Balloon Expedition (Lachambre—Machuron). Illustrated. 12mo., cloth, New York, 1898........................ 1.00
Parakites (G. Woglom). Illustrated. 8vo., cloth, New York, 1896................ .75
The Problem of Flight (Herbert Chatley, B. Sc.) A new textbook of aerial engineering both aerostation and aviation. Illustrated. 8vo., cloth, 1908............ 3.50
Pocket Book of Aeronautics (Maj. H. W. L. Moedebeck). A manual of aviation and aerostation. Illustrated. Cloth, 496 pages, London, 1907.................. 3.25
Ballooning as a Sport (Maj. B. Baden Powell). Illustrated. London, 1907......... 1.10
Navigating the Air (Members Aero Club of America). Illustrated. 8vo., cloth, New York, 1907........................ 1.65
L'Omnibus Aerien (Bourget). A musical piece sung by Mlle. Flore. Has a picture of flying omnibus on front. Is extremely rare. Paris, 1840......... 7.00
Keely and His Discoveries. Aerial Navigation (Mrs. B. Moore). 8vo, cloth, London, 1893........................ 3.00
St. Louis Gordon Bennett race views in an album, full set........................ 3.00
Accounts of Three Aerial Voyages (Mr. Sadler). Small 8vo., boards, autograph of "Mr. Sadler," London, 1810-17. Very rare........................ 5.00
Narrative of the Ascent and First Voyage of the Aerial Steamer (George Aire, F. A. S., A. L. C., etc.). Paper, 16 pp., ill., London, 1843. Rare............. 2.50
Aeronautical Annual (Edited by James Means). 8vo., cloth, ill., 176 pp., Boston, 1897........................ 1.75
Aeronautical Annual (Edited by James Means). 8vo., cloth, ill., 158 pp., Boston, 1896........................ 1.75
History & Practice of Aeronautics (John Wise). Illustrated, 8vo., cloth, 310 pp., Phila., 1850........................ 9.00
Looking Forward; Aerial Navigation (Dr. A. De Bausset). Paper pamphlet, 48 pp., Boston, 1889........................ 1.50
Aerial Navigation (Arthur De Bausset, M. D.). Paper pamphlet, 48 pp., Chicago, 1887........................ 1.50
Sounding the Ocean of Air (A. Lawrence Rotch, S. B., A. M.). 12mo, cloth, ill., London, 1900........................ 1.00
Scientific Experiments in Balloons (James Glaisher, F. R. S.). A lecture before the Y. M. C. A., 1862-3. Cloth, 8vo., London, 1863........................ 3.00
Proceedings International Conference on Aerial Navigation, Chicago, 1893, cloth, 8vo., ill., New York, 1894........................ 4.50
Ballooning (G. May). Small 8vo., cloth, ill. Rare........................ 2.50
Account of the Late Aeronautical Expedition from London to Weilburg (Monck Mason). Paper pamphlet, 35 pp., N. Y., 1837........................ 3.50

AERONAUTICS

THE AMERICAN MAGAZINE OF AERIAL NAVIGATION

SUMMARY

VOL. 2. MARCH, 1908 No. 3.

PRICE, TWENTY-FIVE CENTS

THE "OLDSMOBILE"

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THE CAR THAT DOES THINGS

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CLEVELAND, O. Jan. 16, '08.

O. C. Foster, Esq.,
Mgr. Cleveland Branch,
Warner Instrument Co.,

Dear Sir:-- Last year you furnished me with an instrument which I used on the "Mudlark" in my tour from New York to Florida, and it gave us such good satisfaction that I would like to have one of your clock and light instruments for a model "M" Olds in which I will make a similar run this coming week from New York to New Orleans by way of Syracuse, Buffalo, Cleveland, Louisville and Birmingham.

Trusting that you will give this order your personal attention, and that I may receive the instrument in time, as other speed indicator companies have offered to furnish me free of charge an instrument for this occasion. However, I would rather buy a Warner than accept their offers as the Auto-Meter has always given me complete satisfaction.

I remain, yours very truly

R. R. Owen.
Oldsmobile Co

THE AUTOMOBILE. November 21, 1907.

BUNK

¶ Webster says "Bunkum" means speechmaking for mere show—mere talk. It aptly illustrates the advertising methods of some Speedometer manufacturers. There's a lot of "bunkum" about wonderful tests in tours and races. In most of these events the Speedometers used are not selected and paid for by the car owners, but are installed by some Speedometer manufacturer, *free of charge*, for advertising purposes.

"bunkum" concern-

Our Competitor's Advertisement

Warner Instrument Co.

118 Wheeler Ave., Beloit, Wis.

AERONAUTICS

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VOL. II MARCH, 1908 No. 3

THE GOVERNMENT DYNAMIC FLYER.

We are either playing fast and loose with false hopes or history is being made too rapidly for recording. When our Government issued specifications for a dynamic flying machine we were astonished. To demand that the machine carry two people with gasoline for a hundred and twenty-five miles, that it maintain an average speed of at least 36 miles an hour for the whole sixty minutes, that it be simple in construction and operation, and return to the starting point at the conclusion of the flight in such shape as to be able to immediately fly again, seemed beyond all reason. We knew that aerial locomotion had been proven practicable, we knew that it had even been most successfully accomplished on many occasions, but we believed the art still in its infancy.

When we heard that three had actually contracted, under penalty of forfeiture to the extent of forty-six thousand dollars, to fulfill at present the seemingly impossible conditions we were completely astounded. One fails to realize the proposition. The magnitude of what is too close we are never able to measure. The results of what is really an event we are unable to predict. We had boats and it does not seem so great to have made them self-propelled. We had beast-drawn vehicles and they were made to move of themselves. But to conceive the wonderfulness of locomotion in air—!

When steam was applied to means already at hand five continents were made into one and the earth shrunk under its rule. The aims of lands and forms of commerce, human occupations and communication, the manner of war and the structure of the social body were changed. The conquest of the earth was achieved by man. Everything was changed, overthrown, enlarged and created anew. What was not altered?

Now we have invented a new means! To consider the future is to become lost in a maze of possibilities. To predict is futile.

When the specifications were made public, few of those practical men whose achievements have made their opinions weighty, were optimistic enough to imagine that the requirements could be met by any one. The acceptance of the bids proves

three men either foolhardy or the rest of us way behind the times. With all our hearts we hope the latter may, in this instance, be found the case. A failure on the trial-day would be a terrible blow to aeronautical progress in America, and we would say, better had we gone more slowly.

THE VALUE OF THE MOTORLESS GLIDER.

By James Means.

We have to face the fact to-day that, owing to the public exhibitions of flights with motor-aeroplanes in France, the Frenchmen are in a fair way to get years ahead of us in aviation, as they did in the development of the automobile.

However well we may have accomplished the task of catching up in automobile design and construction, we should be far from content with having such a task saddled upon us in the case of the motor-aeroplane.

The only thing we lack here is a widespread interest in the subject. We must wake up and have some enthusiasm, and above all a spirit of emulation.

Some of the more ambitious aviators are inclined to think that motor-aeroplanes are the only machines with which they can win high honors, and I greatly fear that this mistaken idea is to cost many of them their lives.

Lilienthal, the dauntless engineer, gave this instrument to the world fifteen years ago, yet the number of men who have appreciated it to the extent of actively aiding in its development is ridiculously small.

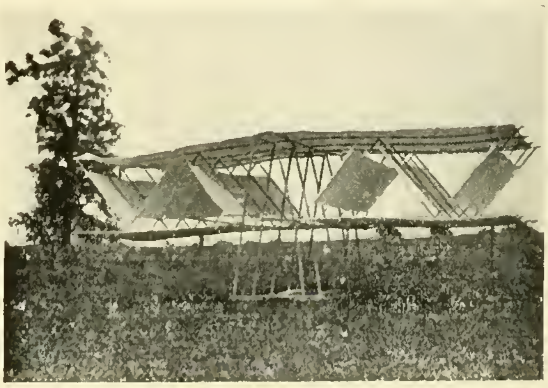
The importance of the motorless glider is twofold.

First, the skill which may be acquired by its use prepares men to encounter the dangers of motor flight with the least possible risk.

Secondly, its comparatively low cost will enable many experimenters to enter the field who would otherwise be debarred by lack of funds.

In regard to the first subject, may I quote here a paragraph which I wrote twelve years ago:

"One thing is certain; if the problem of flight had been fully solved by someone unknown to us, and if that person were to present us with a perfect flying apparatus, that instrument would be of no more immediate use to us than the latest safety bicycle would be to the King of Dahomey, or a pair of skates to a man who had never seen ice. Bicycling, skating, walking, swimming and flying are all movements which must be learned by practice, if at all."



THE DUFOUR GLIDER.

Children often use floats in learning the motions of swimming. We know not what the future may bring forth, but it now seems to us that men will always begin with motorless gliders in learning to fly. If this be so, the great thing to be done is to lessen the loss of human life by making the glider as safe as possible. If it cannot be made absolutely automatic in the preservation of its equilibrium, it can certainly be made much more so than it is at present.

Lest I seem to overestimate the value of the motorless glider, let me say here that I do not lose sight of the fact that, when the thrust of a screw is applied to a gliding machine, there is a force to be reckoned with, which to the mere operator of a motorless glider is a new one. What I wish to emphasize is the fact that any machine of the Wright or Farman type is liable at times to become strictly analogous to the motorless glider. I mean when from any cause the motor stops during flight. Then the Wright or Farman type of machine becomes, for the time being, a motorless glider, and is exactly on a par with a gliding machine in which the motor is represented by ballast of suitable shape, position, size, and weight.

To be of practical use for military or any other purposes, a motor-driven aeroplane machine must be under good control when it has no energy but the potential energy of altitude. A machine which is seriously endangered by the stoppage of its motor will never be useful unless its defects can be remedied.

Hence, the subject of investigation and experiment divides itself. There will be two classes of experimenters: those who attempt at large, and oftentimes at wasteful expense, to use motors and do the whole thing; and those who, at moderate expense, attempt only a part, and who make a specialty of perfecting the motorless glider.

Experimenters who undertake the latter will fit themselves to operate motor machines later on.

The Wright Brothers were enabled to achieve motor flight because they fully realized that the mastery of the motorless glider must precede complete success with a motor aeroplane.

Lilienthal, who—probably through over-confidence—came to an untimely end in 1896, made, as is well known, thousands of successful glides. His glider was later thoroughly tested by Chanute, who found it to be "cranky and uncertain in its action and requiring great practice."

Lilienthal, by long practice, acquired remarkable skill in balancing, and thus was enabled to render a service to the world, which has placed his name upon the roll of the immortals.

Chanute, as is also well known, took up the work and, applying his engineering knowledge with untiring energy, evolved a type of glider of such improved stability that he was able to write: "We found that a week's practice sufficed for a young, active man to become reasonably expert in manoeuvres, and hundreds of glides were made with the several machines experimented with in 1896 under variable conditions of wind, without the slightest personal accident.

GLIDER No. 2 OF L. J. LESH.

Everyone who intends to learn concerning the design, construction and operation of motorless gliders should read the writings of Lilienthal, Chanute and Wilbur Wright.

Two of the most instructive articles ever printed are those by the latter which will be found in *The Journal of the Western Society of Engineers*, published in Chicago. The titles and dates are as follows: "Some Aeronautical Experiments," December 1901; "Experiments and Observations in Soaring Flight," August 1903.

Mr. Wright says: "The bird has learned the art of equilibrium, and learned it so thoroughly that its skill is not apparent to our sight. We only learn to appreciate it when we try to imitate it. Now, there are two ways of learning how to ride a fractious horse; one is to get on him and learn by actual practice how each motion and trick may be best met; the other is to sit on a fence and watch the beast awhile, and then retire to the house and at leisure figure out the best way of overcoming his kicks and jumps.

"The latter system is the safest, but the former, on the whole, turns out the larger proportion of good riders. It is very much the same in learning to ride a flying machine. If you are looking for perfect safety, you will do well to sit on a fence and watch the birds, but if you really wish to learn, you must mount a machine and become acquainted with its tricks by actual trial."

Could any one give sounder advice than the above?

In my opinion gliding machines should be made so that they will not be injured by being immersed in water for a short time. Gliding should by beginners, be attempted only over water. The ideal method of launching is from a captive balloon anchored over a sheet of water.

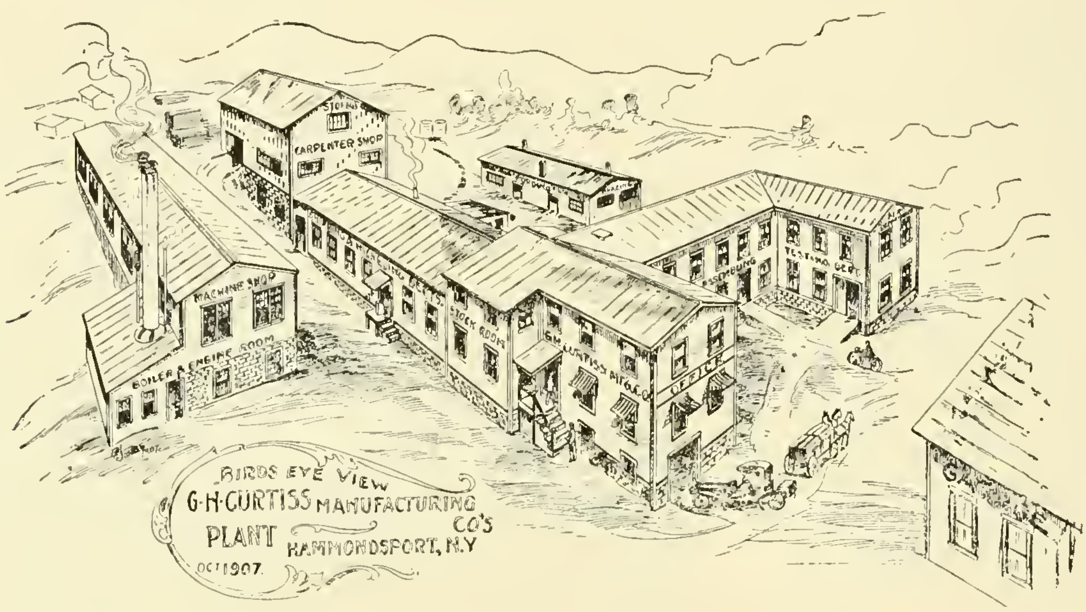
The beginner may glide from small heights at first and gradually increase the

height of starting point as he gains the knowledge which comes from experience and as he loses the confidence which comes from ignorance.

Note:—Those who are constructing gliding or other aeroplane machines may be interested to know of a labor-saving device invented and patented by Dr. Alexander Graham Bell, Patent No. 856,838, June 11, 1907. "Connection device for the frames of aerial vehicles."

THE HAMMONDSPORT AERO EXPERIMENT STATION.

The amount of apparatus constructed in the course of a year is rather astonishing. Those who are not actually interested in the art have no conception of the magnitude of the work being done, and, strange as it may seem, those whose greatest interests are in the work do not seem to realize the extent to which experiments are being conducted.

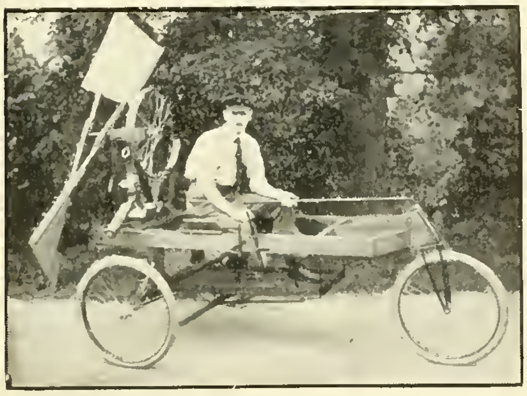


They hear almost daily of new machines started or completed, but the constant announcement of these events have made devotees of the new art so matter-of-fact that they do not stop to count up. We see such great advances made every day in science and commerce that we become accustomed to events which, a half century ago, would have startled the world. In aeronautics, the same. When Santos Dumont over half a score of years ago circled Eiffel Tower with a steerable balloon the world almost stood still, statements were made that aerial navigation was an accomplished fact and wild prophecies were put out for the future. Now that we have, for all purposes of demonstration, actually solved the centuries-old problem with a machine hundreds of times heavier than the air it displaces, we accept it with hardly a remark. It seems to be in the nature of things that, with the growing coldness of modern life, we see no reason for a display of emotion.

While America first showed the practicability of dynamic flight, demonstrated the assertion by making a motor driven model fly, and then produced a well-nigh perfect man-carrying motor machine, it remained for France to make the flying machine a thing of commerce. The building and sale of flying machines has grown to such an extent in France that at least one concern, Messrs. Voisin Brothers, has a complete factory exclusively devoted to the manufacture of material aeronautic, models, aeroplanes, airship frames, propellers, etc. During 1907 a dozen or more full-sized machines were produced and sold. They now announce that they will contract to build an aeroplane guaranteed to fly a kilometre in a circuit for something like $6,000, complete with motor. It is interesting to note in passing that their guaranteed machine is the Herring-Chanute-Wright type.

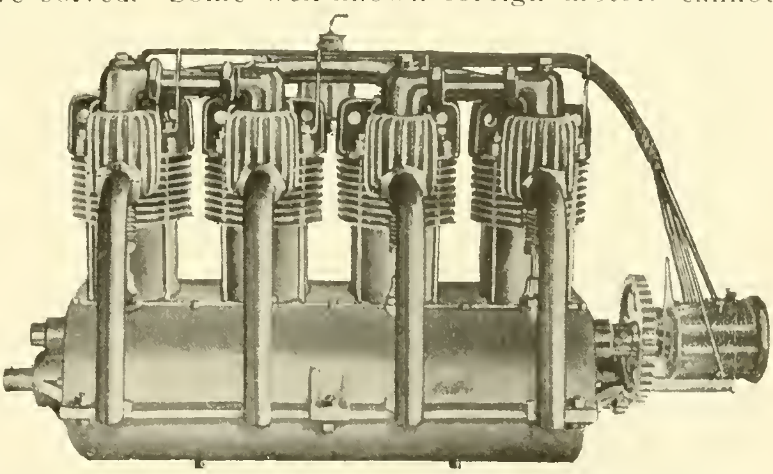
In America we have an experiment station which bids fair to rival that of the Brothers Voisin. Half a dozen years ago Glenn H. Curtiss started to build motor-cycles. He designed his own engine and produced one of very light weight. Good gray matter and expert workmanship produced a machine and motor which beat the world. No other motor was there which approached the Curtiss in its adaptability for use in aerial apparatus. Inventors went to Curtiss for their motors. Curtiss saw the

trend of events and went to work to still further lighten and improve his motor. This study brought greater success for his motorcycles and almost invariably races in which "The Curtiss" was entered were won under the name Curtiss. Not content with merely beating other motor cycles, Curtiss decided to lower the world's speed record—and he did. The fastest mile had been held by a steam driven automobile, 28 1/5 seconds. With an 8-cylinder, 40-horsepower "The Curtiss" he lowered the record to 26 2/5 seconds at Ormond Beach, Florida, the fastest mile ever travelled by humanity. One hundred and thirty-five miles an hour! A motor that would do that was thought to be good enough to put in a flying machine, and it was used for that purpose.



G. H. CURTISS IN THE "WIND-WAGON."

Inventors of aeronautic apparatus needed a workshop fitted with up-to-date machinery. They could not install individual plants, and they wrote to Curtiss at Hammondsport to know if they could do their experimenting there. Curtiss said yes, and they came, each year a few more. The motor business kept growing and new buildings were added. The inventors had to have buildings for their work—result, more additions. Captain Baldwin went to Hammondsport to build his California Arrows and needed a "hangar." One was erected in a level field on the shore of Lake Keuka and called "The Aerodrome." Meanwhile Curtiss kept selling light motors to the airships of the country, to the Government for its Signal Service, and to the experimenters at Hammondsport and all over the United States. A Curtiss motor drove the first successful airship in America, and a Curtiss motor was the first to drive a helicoptere into the air. During 1907 over three hundred and fifty motors were built, of which fifty were for aerial experiment work—rather a surprising number for one concern. Light motors that mote constitute a problem that few have solved. Some well-known foreign motors cannot run more than fifteen minutes at a stretch. Of what use would such a motor be to a man who has to keep his machine in the air an hour or more? Curtiss had foresight enough to see the impracticability of such extreme lightness, and, if we take the word of the Wright Brothers, of what value is a "to-the-limit" weight? Curtiss motors and Curtiss workmanship brought the services of this genius into demand, and he was invited to join the Aerial Experiment Association of Dr. Alexander Graham Bell at his summer laboratory, Beinn Bhreagh, Nova Scotia. With the coming of Winter the headquarters of the Association were transferred to Hammondsport, adding still another to the half dozen interests already located there.



A CURTISS LIGHT 4-CYLINDER MOTOR.

Jolly good fellowship reigns at Hammondsport between the various experimenters, one discusses his plans with the other, gives his advice, etc. A visitor to the works sees frameworks of aeroplanes, kite cells, propellers, gears and shafting, parts of dismantled apparatus cast aside or of new machines awaiting completion and trial, hung from the ceilings of the many buildings, stowed under work benches and, in the corners, concrete expressions of ideas. In one building, along with cycles by the hundred, is a helicoptere almost complete; in a dark corner is a "wind wagon" used for testing propellers and motors; in a corner of another building stands a motor iceboat with aerial propellers; in still another building is a curious looking ornithoptere, while a few doors further on is a dirigible balloon in process of construction; down on the shore of Lake Keuka, in the "hangar," Dr. Bell's Association has established a promising looking plant, a glider and a few tetrahedral kites in close proximity, and a motor aeroplane almost completed occupying the greater part of the space; up under the rafters is another ornithoptere dormant for the Winter.

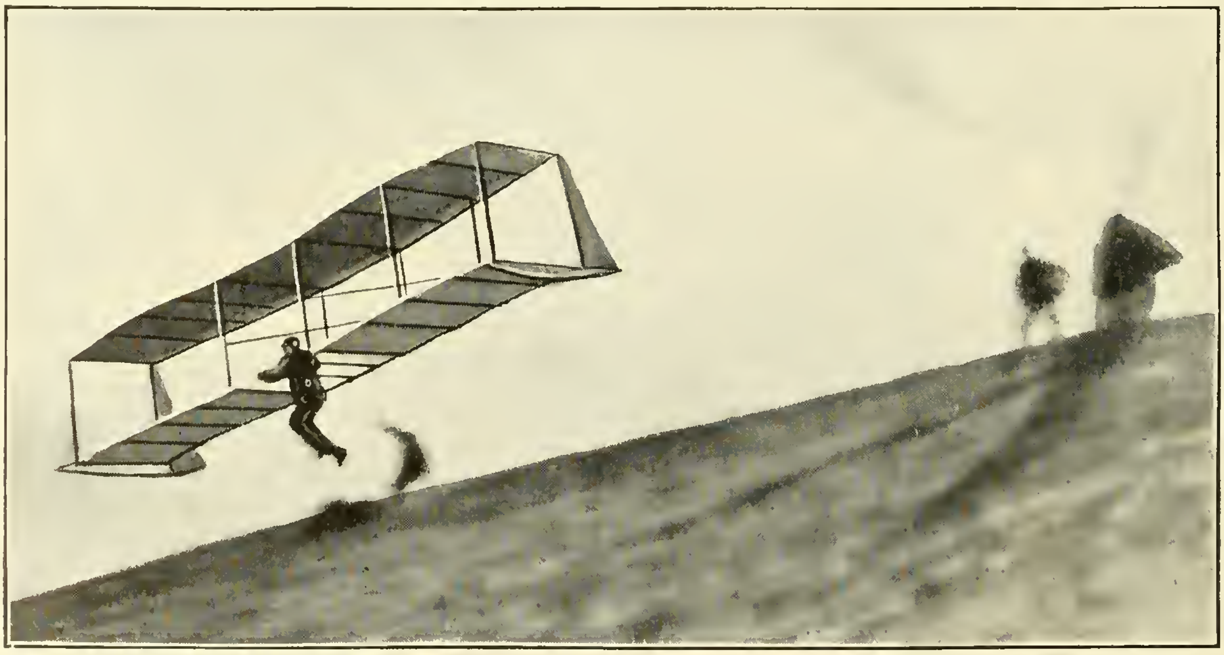
From the knolls south of the Lake the glides are made. These knolls are a joy

forever to the glider, for no matter which way the wind blows, one can always head into it.

The Government's first airship contract, for which has been given Captain T. S.

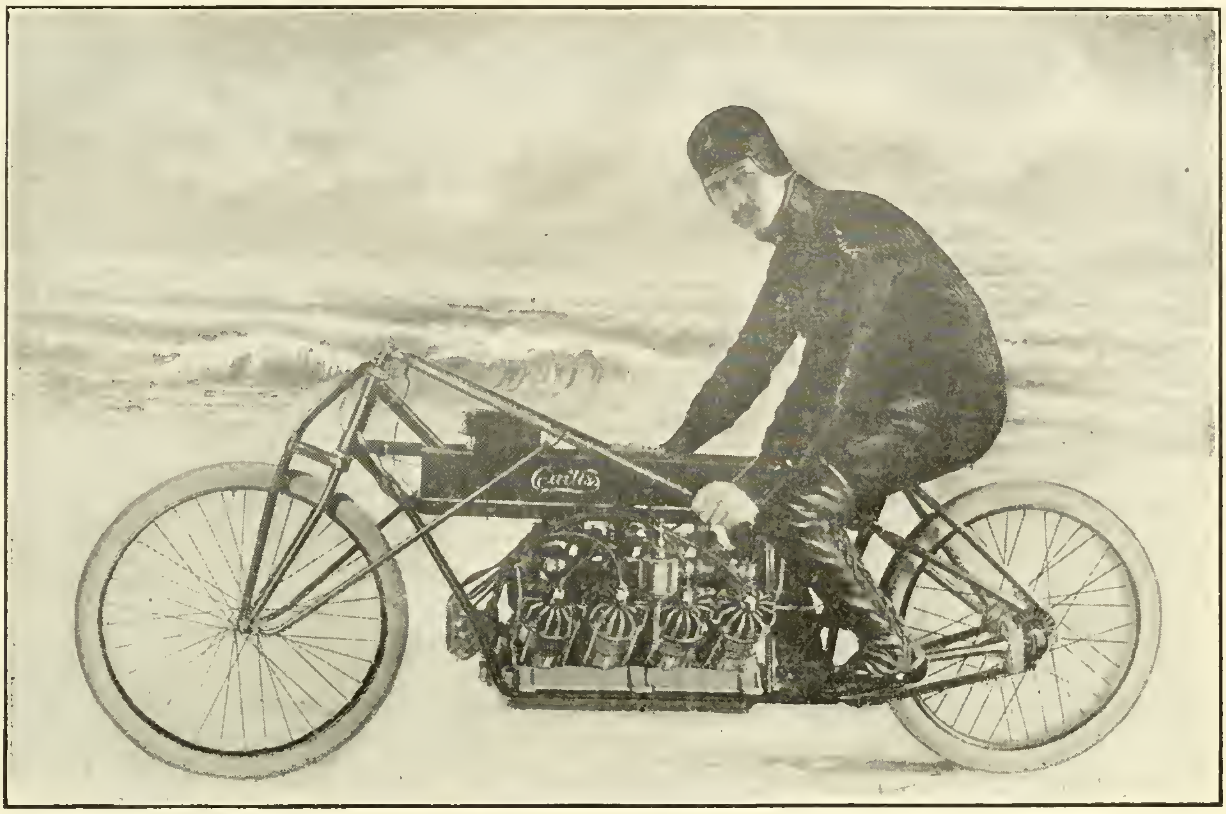
FIFTEEN HORSE POWER ICE CYCLE

Baldwin, will be built at Hammondsport and equipped with a specially-designed, water-cooled, 4-cylinder Curtiss, 30-horsepower engine.



G. H. CURTISS STARTING ON A LONG GLIDE

Great things are being done at Hammondsport. The genius of one man has made possible all these things. Hammondsport, the aeronautic center of the country!



G. H. CURTISS AND THE MOTOR CYCLE THAT HOLDS THE WORLD'S SPEED RECORD.

SAILING IN AN AIRSHIP.

By Walter Scott Haskell.

The moon is bright, the stars are out,
The air is soft and calm;
Come ride in my new airship, dear,
I'm sure it is no harm.
We'll skim the trees and cross the lees,
And pass the village spire;
We'll then go down into the town
And seek the village squire.

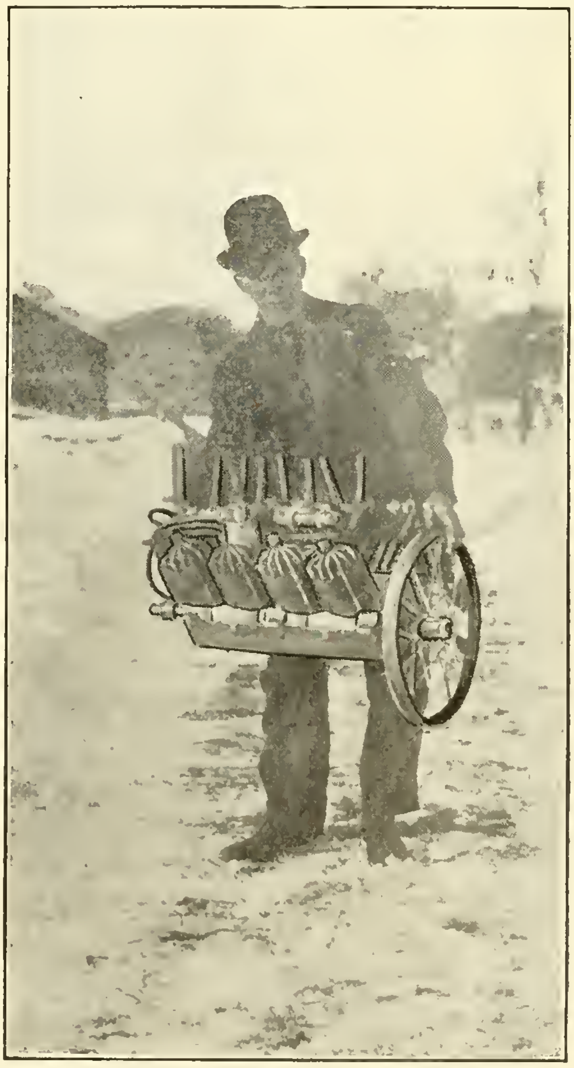
CHORUS

Oh, sailing in an airship is,
The cream of all delights;
And taking willing prisoners,
A lover's natural rights.
Sailing in an airship,
Sailing to the moon;
Breaking sparkers, getting wrecked,
Is quite a lover's boon.

I hear you say "Some other day,"
That papa would object;
That mama always was afraid
By airship you'd be wrecked.
And then you smile at me and say
With lips of ruby hue:
"I cannot go, of course I can't—
I wish I could, don't you?"

CHORUS:

We stepped aboard the waiting ship,
Just for a little fly;
The sparker in the motor broke,
And up we went so high,
We had to pull the safety valve,
To let ourselves below;
'Twas at the village, and the squire,
He married us you know!



40 H. P. CURTISS MOTOR, WEIGHING 150 LBS.

ON THE USE OF LIQUID HYDROGEN AND HYDROGEN-CONTAINING-COMPOUNDS IN LONG DISTANCE BALLOON FLIGHTS—In Three Parts.

By Darwin Lyon.

Of late years, though there has been an increase in the interest shown in every branch of aeronautics, the interest of both the public and the inventor has been given more and more to the gasless machine, to the exclusion of the balloon. Interest in the latter, however, was greatly revived by the St. Louis race, and in this country is being maintained by the projected long distance trips of Glidden and Forbes, the numerous schemes for crossing the Atlantic by balloon, and the various aero-club flights. It is solely with long distance balloon flights that this article is concerned.

That the gas supply may be replenished while a balloon is in the air I have no doubt, but I have never heard or read of its being tried. However, it is not so much for this reason that this article is written, as that I may have called to my attention any objections or difficulties that may exist and of which I am ignorant.

From data furnished me by the Aero Club of America I find that lack of sufficient lifting power is the main cause of early descents. I include exhaustion of ballast with lack of sufficient lifting power, for the reason that the former is nearly always indirectly due to the latter. In the St. Louis race the only balloon to descend for either of these reasons was the "United States," piloted by Major Hersey. And, strange to say, the "United States" instead of being the second to descend would probably have been the last, had it been able to carry a supply of liquid hydrogen, for it took the most northerly course of the nine balloons and could have travelled several hundred miles further than the others before striking the Atlantic. The "United States" landed near Lake Ontario, and, with the exception of the "Lotus II," was the first to come to earth. Major Hersey was the only competitor who was able to locate and hold the northeasterly course which the aeronauts expected to follow. But, as before said, both gas and ballast gave out, and he was forced to descend.

A balloon loses its gas in three ways, and through three channels—through the pores, through the valve, and through the neck. The first is unavoidable until we improve upon our present system of varnishing; the second at present is also unavoidable, for when the pilot wishes to descend, say, to a different air current, he must needs open the valve and allow gas to escape. The other way in which gas is lost is also unavoidable, for upon reaching a high altitude the gas expands to such a degree that the balloon would certainly burst unless an escape were allowed through the neck or the valve.

Experience has proven that using the best balloon at present obtainable, flight cannot be prolonged beyond 48 hours' duration.* It is obvious that the only way left by which the stay in the air can be lengthened is to in some way compensate for the loss of gas by directly replenishing it.

Why carry such a miserable article as sand for ballast? Can we not carry chemicals which when properly treated will give off hydrogen gas, leaving a residue which we could then use as ballast?

This brings us to the question, from what substances and how can hydrogen be prepared. The various ways of preparing hydrogen are enumerated below. Looking over these ways, it will be seen how few are at all practical for our present purpose: (1) Decomposition of water by sodium; (2) electrolysis of acidulated water; (3) action of dilute sulphuric acid on zinc; (4) dissolving magnesium in dilute sulphuric acid; (5) passing steam through a tube containing red hot iron turnings; (6) action of zinc upon aqueous solutions of the salts of ammonia; (7) heating of sodium in gaseous hydrochloric acid; (8) heating of zinc with a solution of potassic hydrate; (9) heating of formates or oxalates with an excess of a caustic alkali; (10) action of intense heat upon steam; (11) destructive distillation of certain organic substances; (12) addition of water to such hydrogen containing compounds as Hydrone, Hydrolith, etc.

Nearly all the above methods admit of many modifications. Thus, for instance, potassium may be substituted for sodium in No. 1, and iron for zinc in No. 3. On looking over the list it will be seen that nearly all are impracticable in the basket of a balloon. Thus though at high temperatures calcium hydroxide can easily be decomposed by pulverized zinc with the evolution of large quantities of hydrogen, the apparatus required is far too cumbersome.

With others, the amount of hydrogen given off is relatively small. With still others, the objection is that the evolution of gas is extremely slow. Even with the best possible combination of chemicals and these in their purest form, and disregarding the necessary apparatus, eight of the twelve methods would require the carrying of over 400

*The present official record is 44 hours, 5 minutes, though the longest time a flight has actually lasted is 52 hours (Drs. Wegener).—Ed.

pounds of chemicals for the production of each 3,000 cubic feet of hydrogen gas. No. 12 is the only method worthy of our consideration.

By examining the chemical formulæ of all the compounds coming under this head, I find only three that yield a relatively large amount of hydrogen. Of these, the best is calcium hydride, the others being inferior for various reasons. Calcium hydride, or "Hydrolith" as it is more popularly known, does not occur free in nature. It has been known theoretically for many years, but its manufacture in quantities is of recent date and is at present almost confined to France. Upon contact with water it evolves hydrogen gas in large quantities, but not with so explosive a violence as does hydrone, which, however, in other respects, it resembles. Hydrone is a lead sodium alloy and in the shape usually found on the market furnishes almost immediately upon contact with water 2.26 cubic feet of hydrogen per pound. The amount of gas yielded by hydrone can be increased by raising the percentage of sodium, but with a risk of inflammability Hydrone can be bought in ten-pound tins at 60 cents per pound. Calcium hydride if chemically pure will yield over 18 cubic feet of hydrogen to the pound. The commercial product, however, rarely yields more than 16 cubic feet to the pound. One sample tested yielded only 14.5 cubic feet to the pound. Theoretically, for each 7 parts by weight of calcium hydride we would need 6 parts of water, but in practice I have found that often nearly an equal weight of water is needed. The irregularity depends upon the nature of the impurities present, that is, the degree of solubility of the impurities. Thus, to obtain 16 cubic feet of hydrogen would necessitate the carrying at least 2 pounds of material and to obtain 3,000 cubic feet of gas we would need nearly 375 pounds of material (water and calcium hydride). The above does not include the weight of the necessary apparatus, but this would be inconsiderable, for I find that an ordinary acetylene generator answers the purpose. With a few modifications this would be admirable. However, it is obvious from the above, to say nothing of the expense (Hydrolith costs about $1 a pound), none but the large balloons could carry enough calcium hydride and water to produce over 5,000 cubic feet of hydrogen. As an example, using the excellent gas now furnished at North Adams, the "Stevens 21," of 35,000 cubic feet capacity, carried besides the two aeronauts 560 pounds of ballast. Supposing this amount of ballast could be turned into calcium hydride, we could obtain therefrom 4,480 cubic feet of hydrogen gas. The solid residue remaining after all the hydrogen had been given off from 560 pounds of material would be 531.2 pounds to be used as ballast.

How now can we manage to carry aloft with us a larger supply of hydrogen? There is but one way left, and this is to carry hydrogen not in combination with other substances, but as free hydrogen.

Hydrogen compressed in steel cylinders is out of the question because of the great weight of the containers; so we have left but the one alternative—liquid hydrogen. If there exist any great objections to its use I have been unable to discover them. Probably the most serious objections are the expense and the difficulty of carrying so large a quantity of an extremely volatile liquid.

(To be continued.)

* The ordinary tanks containing compressed oxygen as used in the hospitals hold on the average 100 gallons of gas at 200 pounds pressure. Though made as light as safety will allow, they weigh 30 pounds each.

Next month the author will take up the manufacture, nature and properties of liquid hydrogen and the construction of the various receptacles used for holding it.—Ed.

THE WILLIAMS HELICOPTER.

Mr. J. Newton Williams, of Derby, Conn., member of the Aero Club of America, who has devoted some years to the study of aeronautics, particularly mechanical flight, and has developed some models that have given very interesting practical results, both in ascensional power and dirigibility, has lately constructed at the H. C. Cook factory, Ansonia, a helicopter of man-carrying size. Connecting it by belts and flexible shafts to the factory power for the purpose of testing the thrust of propellers at different revolution speeds, he has made numerous trials, getting a maximum direct vertical lift of over 500 pounds.

Mr. Williams has now taken the machine to Hammondsport, N. Y., to install an 8-cylinder, 40-horsepower, air-cooled Curtiss motor weighing 150 pounds. On the first test with the motor in place the complete helicopter was lifted, together with some added weight.

The machine was then dismantled to make some changes for the purpose of increasing the power of the motor and reducing the weight of the whole structure. Further trials will be made within a few days.

INTERNATIONAL AERONAUTICAL CONGRESS.

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Publication Notice.

The addresses, papers and discussions presented to the Congress will be published serially in this magazine, and at the earliest date possible, bound volumes will be distributed without charge to those holding membership cards in the Congress. Others may purchase the volume at a consistent price when ready or may take advantage of immediate publication by subscribing to this magazine at the regular rate.

In accordance with the program as published in the November number, the informal addresses of the Gordon Bennett contestants and others were concluded before entering upon the printing of the formal papers and discussions.

Owing to an unfortunate mishap, we are obliged to omit the sixth paper for this issue and present the seventh paper, "Curvature a Relative Term," by G. A. Spratt; with discussion by Octave Chanute.

Curvature A Relative Term

By G. A. Spratt

The following is a description of laboratory experiments with a few deductions. The writer believes the experiments are sufficiently conclusive to establish a fact that should be clearly recognized by all designers of flying constructions; a fact through which one of the equilibrium-disturbing actions of the wind may be clearly understood. It is presented with the hope that it may be of interest to those who find pleasure in the analysis of the forces of the wind and be suggestive for further study.

The facts presented are the result of many experiments with the force developed from the contact of air current and surface, into which the pressure, alone, has entered. The weight of the surface in part, or wholly, and the weight and influence of the mountings, have been eliminated from both the experiment and the conclusions. An endeavor has been made to know the pressures in their elementary form, in which form they should be clearly recognized before they can be scientifically used. As found in practice with models, pressure and gravity are hopelessly complicated. It is impossible to know by watching a model in the air, to what extent an action is due to air pressure, or to what extent it is due to gravity.

Gravity has been eliminated from the experiments by placing the surfaces vertically in the air current.

An ideal method for studying the pressures theoretically, consists in placing the surface vertically upon a piece of sheet cork which floats upon water, across the face of which flows a steady and uniform current of air.

Mounted in this way the surface is free from the action of gravity and free to respond in any direction or manner to the influence of the air current. Its action shows the proportion of the pressure components.

If desired, the action of the float may be restricted by parallel arms sheltered from the air-current beneath the surface of the water; threads may be attached to the surface or the float; or the float may be pivotally fixed by a needle point engaging it from above or below.

When a surface is vertically, instead of horizontally, placed in an air

current, the drift is in no way affected. The components acting perpendicularly to the original current, which are termed "lift" when the surface is horizontal, are unaltered as to magnitude, but are spent horizontally.

There is a peculiar force—expressing effect in curvature; an action decomposing the original force which is a distinctive property of curvature, that should be noted before the experiment is described which has been chosen because of its completeness in supporting the title of this paper. A brief comparison of the effect a plane and an arched surface have upon an air current is here inserted.

The pressure of a current of air is normal to the surface at the point of application. It may be resolved into a force parallel with the original force, and one perpendicular to the original force. In the plane the component acting perpendicular to the original force is controlled entirely, by the angle of incidence; at 0° angle of incidence it is non existent.

The pressures normal to the arched surface, taken as a whole, are so acted upon that the effect seems to be a further decomposition of the original force. As in the plane, one component of the normal pressure acts parallel to the original force. The other component is divided; one portion is controlled by the angle of incidence. The other portion is fixed; its magnitude controlled, by the amount of curvature represented in the surface.

This fixed portion of the original force is manifest at all angles of incidence. It is exerted in direction always from the common centre of the radii of the surface toward the surface. It is, therefore, centrifugal in character. It may be considered as acting along the bisecting radius.

When the surface is placed with its chord parallel with the current, this force is effective. In a surface in which the rise is one-twelfth of the chord this centrifugally-acting (or fixed) force will overcome the pressure of three negative degrees. Lilienthal noticed that at slight angles of incidence, this force lessened the drift. This has been recognized also in Hargrave's experiments.

If the surface is placed with its chord perpendicular to the current, with its convexity directed toward the current, this centrifugally-acting (or fixed) force is represented in a total pressure that is less than the pressure resulting from a plane similarly placed, whose length and breadth are equal to the length and chord of the curved surface. If the chord is perpendicular to the current, with its concavity directed toward the current, this force is manifested in a total pressure that is greater than the pressure upon a similarly placed plane, whose length and breadth are equal to the length and chord of the curved surface.

This centrifugally-acting (or fixed) force, which for want of better description, has been referred to as a portion of the original force, is a clearly manifest expression of force, acting in the direction from the common centre of the radii of the surface toward the surface, and is indestructible by the angle of incidence. It is, probably, of an equal magnitude at all angles of incidence.

This fixed centrifugally-acting force is dependent, entirely, upon the amount of curvature represented in the surface. It is not found in the cylinder, nor in a half cylinder. If a thin metal sheet is bent to include any number of degrees, other than 360 or 180, this force will be developed and may be considered as acting along the bisecting radius. It is manifested in shallow curves and is increased with an increase in curvature. It increases as the curvature becomes greater or less than 180°, and increases as the curvature becomes less than 360°.

If a hollow cylinder is placed in an air current, drift only is observed. If a longitudinal strip is cut out from its side to reduce the number of degrees in-

cluded in its curvature, this force asserts itself. If the opening is widened by removing more of the surface material, this force increases. By repeating this process of removing the surface material a little at a time, it will be found that this force, at first, increases. As 180° are approached, however, it diminishes. A further cutting away of the surface increases it. As the curvature becomes shallow it again diminishes. Upon building up a surface in this consecutive way, it will be noticed that the drift increases continuously. As a curvature of 90° is approached it increases at a much more rapid rate than the rate of increase of this fixed centrifugally-acting force.

This decomposition of the original force, which results in separating a portion of it from the control of the angle of incidence, is an essential characteristic of curvature. It is observable wherever there is curvature existing between current and surface, whether a curved surface in a straight wind or a plane in a curved current is considered; but with the following apparent difference in its action.

In the case of a straight wind in contact with the curved surface, its action is from the common centre of the radii toward the surface, but in the case of a rotating wind in contact with a plane, its action is from the surface toward the centre of rotation of the current; therefore, centripetal in character. In this case the action may be considered as exerted along the radius bisecting the surface, and the angle this radius makes with the surface is the angle of incidence.

In either case, whether the surface is an arc in a straight wind or whether the surface is a plane in a rotating wind, if the area, angle of incidence, radius of curvature and velocity are the same, the drift is the same, and the combined action of the fixed force and the force due to the angle of incidence is the same, that is, if considered horizontally as in a flying surface, the drift and the lift are the same. An experiment to establish this may be made in the following way.

Make two surfaces of equal weight and of equal dimensions; one a plane, and the other curved to an arc of known radius. Mount each surface on a post so that it is carried vertically as a vane. Each surface must be equally free to rotate about its post. Both must be mounted in similar proportions respective to the posts. Erect one of the posts carrying the plane on a carriage which can be drawn along a straight track or guide. Erect the other one carrying the aerocurve at the circumference and perpendicular to the radius of a flat disk having the same radius as the arched surface, and having a groove in its circumference to receive a small chord. The disk should rotate horizontally about its centre.

This apparatus may be placed for use either on a table or on the floor. The disk is secured by a fixed pivot passing through its centre, and the track is placed a short distance from it in a line tangential to it. The carriage is placed at the end of the track next the disk, a cord attached to it and carried once around the disk in the groove and then attached.

Now, when the carriage is drawn along the track, the post erected upon it will describe a straight path through the air, and the post erected at the circumference of the disk, will, in the same time, move the same distance, and describe a path curved to the same radius as that of the arched surface.

Give each surface the same initial angle of incidence to the path described by its post. The surfaces, so adjusted, therefore, bear the same relation to their respective paths, and the pressures developed by their passage must bear the same relation to their centres of rotation.

The truth of this is evidenced by the fact that when drawn through the air they both rotate on their posts the same number of degrees. The result of

the pressures on each surface is shown to be the same. The pressures, therefore, must be equal, and although one is a plane and one an arc, they may be said to be equivalent surfaces acting under similar conditions. The conclusion must be drawn that a plane in a straight wind and an arched surface in a rotating wind will give equal results, other conditions being equal.

A second test may be made with the same apparatus, by transplacing the surfaces and drawing them through the air as before. In this test we have equal surfaces acting under conditions that are dissimilar, in an equal degree of dissimilarity, that is, the plane surface is carried in an arched path, and the arched surface in a straight path in which, as before, the angle of incidence of the air currents, taken at corresponding points on the surfaces is the same, and as before, both surfaces rotate on their posts equally, showing that the extent of the action is determined by the amount of curvature existing between the surface and the air current. In this test they rotate about their posts in opposite directions.

In applying the facts clearly supported by these tests, it is safe to say, and it is also evidenced in practice, that when a gliding surface encounters a horizontally rotating wind, the effect is similar to an increase or decrease in the curvature of the surface, in proportion as the relation of curvature is altered.

If the centre of rotation of the current is above the surface, the relation of the curvature is increased and the effect is the same as the effect produced by increasing the curvature of the surface while in a straight wind. If the centre of rotation is beneath the surface, the relation of the curvature is decreased and the effect is the same as the effect produced by decreasing the curvature while in a straight wind. If the centre of rotation should coincide with the common centre of the radii of the surface, for the time being, the surface is practically a plane in a straight wind.

Such a coincidence is an extreme conception, however. Its duration could be but a fraction of a second, and inertia would tend to hold the course true.

Perhaps all who have experimented with large surfaces have found them very difficult to control while in flight if the ribs are not flexible and do not admit of a variation in the curvature of the surface. Those experimenters who have had this practical demonstration will agree that the variation in curvature and support that may be experienced in flight, is the greatest factor in determining the size of the tail and the arrangement for its operation.

In nature there are four distinct manifestations of relative curvature, and in each, "lift" is manifestly present.

There is, first, the curved surface. This is seen most commonly in the bird's wing, and has been the subject of much experiment and observation.

Second, the rotating wind. The little whirlwind so common in hot weather "draws" certain flat objects toward its centre of rotation, so long as there is a motion between the wind and the object in the plane of rotation, but it only disperses the bulky objects which possess no gliding qualities. The "lift" due to the curvature existing between the surface and the rotating wind is toward the centre of rotation of the wind.

Third, a plane rotating on an advancing axis contained within itself. The narrow strip of paper, as it falls rotating and advancing in its descent, may be used as an illustration of this because of its familiarity. This is a true glide. The inertia, and the travel of centre of pressure, combine in effecting rotation continuously in one direction, and the consequent "lift" prevents it from falling straight downward as it does when formed into a cylinder. Another illustration somewhat more forceful, and familiar to nearly every boy, is seen when a flattened block of wood (4" x 1" x ½" or thereabout) is thrown with an overhand throw, with its longest dimension horizontal, and perpendicular to its course, and caused to spin as it leaves the hand.

Fourth, a plane may make a more or less complete revolution about a centre at a distance from it, which centre may or may not be advancing. The apparatus previously described may be used as an illustration, by securing the plane to the post carried by the disk, compelling it to move as one piece with the disk as it rotates about its centre. This is an example of a plane in a rotating wind with the motion inherent in the surface.

The surface may move pendulum-like about a centre, and if so, the passage each way gives rise to a "lift" which is directed toward the centre.

Flying forms of life are so constructed that their wings are capable of describing all of the above movements, excepting, of course, the rotating wind, the origin of which is external.

The wings of many of the insects, especially the diptera, are particularly adapted to the motion last described, which seems to form the basis of their flight.

The wings, apparently, are planes. Their greatest transverse strength is toward the free extremity. By reflected sunlight, and by direct appearance of their wings while hovering, they seem to have a forward and backward motion in a curved path with the curvature directed downward.

If the line of gravity divides equally the amplitude of the vibration of their wings, the "lift" is directed upward and the insect hovers. If the amplitude is greater in tthe rear of gravity the "lift" is directed upward and forward and the insect advances. If the amplitude is greater in front of gravity, the "lift" is upward and backwards, and the insect moves backward. If a line passing through the centre about which the wing vibrates, and also perpendicularly through the wing, divides equally the wing surface, it is in effect the same surface curved to the radius of the arc described by its vibration, in a straight wind at an angle of incidence of 0°, at the actual speed of the wing, and with the concavity directed downward. If this line passing through the centre about which the wing vibrates, perpendicularly divides the wing surface unequally, as the point of division approaches the anterior edge, the effect is equal to a proportionate positive increase in the angle of incidence. As it approaches the posterior edge the effect is equal to a proportionate negative increase in the angle of incidence. If in flight the wings are so adjusted in each passage that this tine is brought near the advancing edge, the figure-of-eight course as described by Pettigrew is the result. However, the figure-of-eight course can be attributed to other causes also.

There is probably no form of life that makes use of only one method of obtaining a relative curvature in its flight, but flight may always be the result of a combination of two or more of the motions described.

There is no fixed arched surface in the wing of the diptera, but this construction may be represented in the elytra of the beetle. Probably, in large winged specimens of the butterflies, the motion of the forward wing is only upward and downward, with a rotation on its axis that will bring the rear edge below the forward edge at the finish of the stroke. This wing motion will give the body an impulse forward and upward. Considered relative to the air the wing passage is downward and then forward in an arched line and may be classed under the motion described under No. 4.

The rear wing of the butterfly seems to act as a substitute for inertia, combining the action of wing and tail. Taken together their motion is imperfectly wave-like.

The wing of the bird is most highly constructed, and is capable of producing a relative curvature in the three ways described, and also of controlling the "lift" of the rotating winds which may be encountered. The fixed arched surface is represented in the portion next the body. The flattened portion nearer the tip may be rotated independently of the curved portion, or the

entire wing may be used as a unit. The stroke may be considered relative to the air, as a straight line downward and forward with the flattened portion rotating about its axis; or as a curved line, downward and then forward, with its transverse line fixed in reference to the body joint as a centre. In either case "lift" is developed by the flattened portion. The wing, therefore, is capable of developing more lift than is thought by a consideration of the arched portion only.

It is unnecessary, perhaps, to state that there is a great difference in the appearance of the stroke of the various birds.

These statements concerning wing-motions are supported by field observations only, but the theory seems to be supported by them, i. e.: that by the wing motion a relative curvature is caused, so that the consequent "lift" may be utilized in flight.

Discussion of Mr. Spratt's Paper..

By Octave Chanute.

Mr. Spratt's paper is somewhat obscure, but is worthy of closer study than the casual reader is likely to bestow upon it. He brings out an element of instability in flight which has been taken into account by few experimenters. They consider alone the changes produced in the apparatus by the movement of the centre of pressure and but seldom attribute the variations of support which they experience in actual flight to the relations of the wind.

When once pointed out it seems obvious enough that whether the curvature be in the surface or in the path of the wind, the practical effect will be the same, and the experiment described shows that an aerocurve, encountering a wind which rotates with the same radius of curvature as itself, is no more effective in support than is a plane meeting a straight-away wind. The occasions will indeed be rare when the radius of such wind gyration will be the same as that of the aerocurve, but its balance and supporting power will be affected in some measure.

Now, nearly all brisk winds gyrate more or less, and this indicates that the experimenter should either provide some method of meeting, through his own actions, such gyrations when they occur, or seek for some combinations or forms of surfaces which shall adjust themselves automatically to the varying turmoils of the wind. One such arrangement consists in the flexible rear surfaces of the wings of birds, which, curiously enough, have seldom been resorted to by man. There are also various combinations of fixed or of movable surfaces which will be found greatly to increase the stability.

Mr. Spratt's field observations of wing movements are curious and well worth the attention of experimenters.

INTERNATIONAL SCHOOL OF AERONAUTICS.

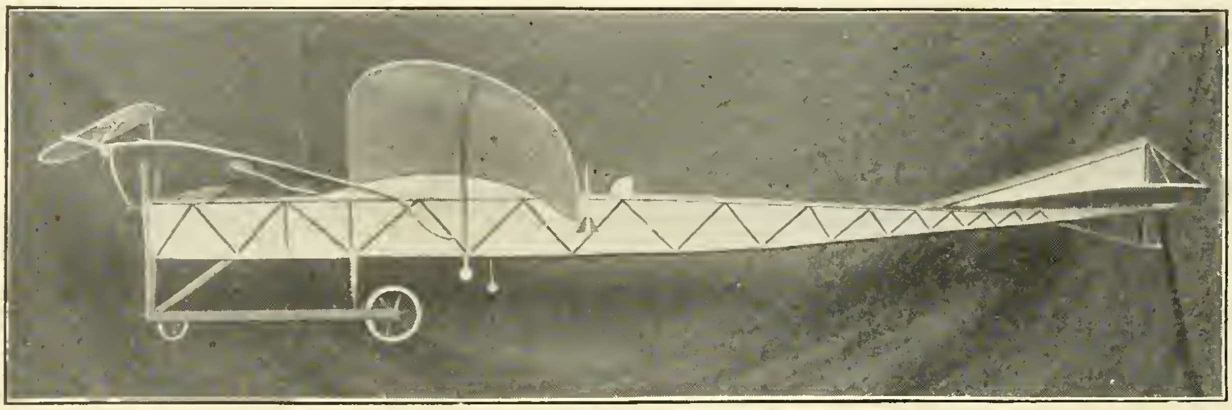
As an indication of the extent to which interest in aeronautics is developing, the starting of a school to quickly help students to a groundwork of knowledge in the new art is a noteworthy incident.

The progress that has been made in the solution of the problems involved in the construction and use of apparatus for the navigation of the air has awakened the interest of inventors, scientists, and the public generally, but investigators have been hampered by the difficulty of obtaining accurate data on the results attained by workers in the various parts of the world. The navigation of the air is advancing so rapidly that books are out of date by the time of their publication, and experimenters have been constrained to solve each step for themselves because there was no way in which they could ascertain the results accomplished by other workers in the same fields.

M. Albert C. Triaca has made it his work to remedy this, and to classify in a concise, practical manner the work done in all branches of aeronautics, and the courses now offered by The International School of Aeronautics are the most complete and authentic exposition of matters pertaining to the science that has ever been collected. These courses, which are arranged for home study, consist of lessons, accompanied by nearly three hundred figures, diagrams and charts on separate plates, were prepared by Lieut.-Col. Espitallier, the foremost of the aeronautic experts of the French Army.

Associated with the school is a technical staff, composed of the most eminent authorities, and their collaboration has resulted in the production of papers in which the investigator will find the results and every detail of the work that has been done; the methods of the most successful aeronauts and aviators; the details and construction of balloons and dirigibles, gliders and aeroplanes, helicopters, ornithopters, and all other forms of apparatus; scientific data, formulæ and tables and a fund of similar information such as is obtainable in no other quarters.

The International School of Aeronautics offers three courses, first, covering spherical balloons; second, dirigible balloons; third, heavier-than-air machines. It is the duty of the technical staff to supply new material and additions to the courses whenever an advance in the art warrants it, and makes it necessary, and as these men are the most eminent in their profession and are in close touch with the school management, the students will have the benefit of the latest process and development.



THE SCHOOL'S MODEL OF THE AEROPLANE "ANTOINETTE."

Three lessons will be sent at a time for study, and the students will answer the questions that accompany them. With the next set of lessons the answers to the questions of the first will be forwarded that the students may make comparisons and check his understanding of the work. The lessons are prepared with the text matter on one side of the sheet only, the other side to be used for making notes. The courses will be completed with supplementary lessons on dirigibles and aviation by Col. Espitallier and Capt. Ferber.

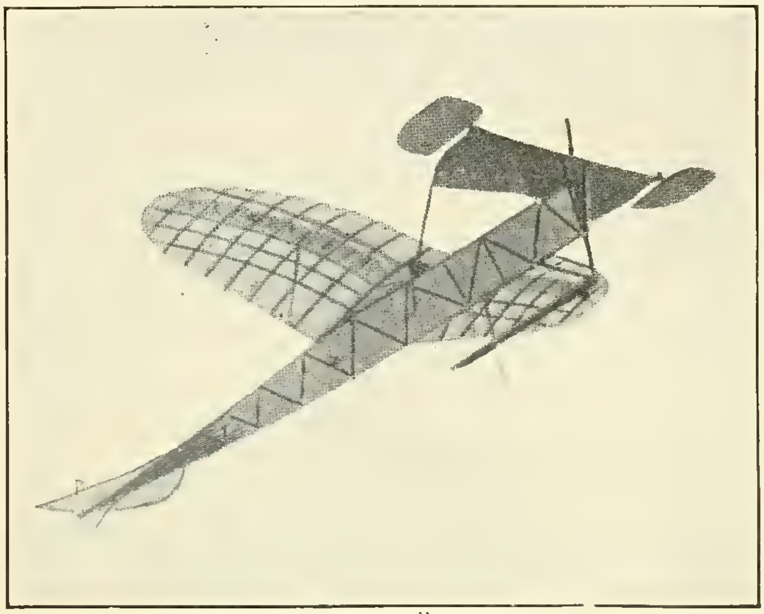
The equipment of the school office is very complete and the library, in addition to books on aeronautic subjects, includes files of the aeronautic magazines; a very extensive collection of photographs of all types of apparatus, and several hundred stereoscopic views. There are also models of air ships and aeroplanes built in the best French factories, a model of a spherical balloon for practical demonstration, motors, wood and metal screw propellers, supplies, instruments, and accessories for aeronauts, fabrics, ropes, and varnish for aeronautical work, etc.

Among the privileges granted to the enrolled students are:

A discount of 10 per cent. on subscriptions to Aeronautics, the "Scientific American," the "Aerophile," the "Revue de L'Aviation," and other aeronautical magazines. Ten per cent. discount on scientific instruments for aeronautic use, specially manufactured by Hue, Paris. Consultation with the technical staff of Paris, and the right to their advice and assistance. An ascension (all expenses paid) will be given to one student of every twenty who have completed the spherical balloon and dirigible courses. The student to be selected by ballot. The ascent can be made either in America or Europe, and if the student does not care to avail himself of it he will receive $50 as an equivalent. Upon the completion of one of the courses the student will receive a suitable certificate.

M. Albert C. Triaca, founder and director of the School, was connected with the New York School of Automobile Engineers, as director of the Foreign Department. He is a pilot licensed by the Aero Club of France; for the past year in Europe has devoted his energy to careful study of the construction and management of balloons and heavier-than-air machines, and is thoroughly familiar with the subject.

The spherical balloon course includes: Historic Summary of the Invention of Balloons. Ballooning after Mongolfier—Military Balloons, Captive and Free. Scientific and Sporting Aeronautics. Definition and Principles—Ascensional Power of Gas —Vacuum and Metallic Balloons—Balloon Composition. Ascensional Force—Composition and Weight of Air—Weight of Inflating Gases—Ascensional Force of Ordinary Gases—Relations between Altitude and Barometric Pressure. General Form of Cover—Different Methods of Making the Cover. Nature of Fabrics—Uses for Cover Making—Strain on Material. Valves — Their Functions—Position — Dimensions. Car and Net—Different Methods of Suspension. Accessories —Captive Suspension—Military Equipment of Captive Balloons in Germany. Static Equilibrium of a Balloon on the Vertical—Air Balloonet. General Remarks on the Duties of the Pilot — What an Improvised Aeronaut Should Do. Various Instruments Used in Aerostation. The Regulations—Measurement of the Gas—Preparation—The Ballast—Its Use. Ascent to a Great Altitude—Long Duration and Long Distance Ascents. Use of the Ballast in the Course of an Ascent —Preparations for the Definitive Descent—On the Landing. Practical Information for the Ascent—Log Book—Landing Certificate—Estimation and Payment of the Damages done by the Landing. Sounding Balloons. Kites—Installation of Kites—Applications to Photography. Manufacture of Hydrogen. English, German and French—Technical Dictionary.



A MODEL "ANTOINETTE" IN FLIGHT

Dirigible Balloon Course: Historical Sketch—Heroic Period of Various Navigations. The Present Time—From the Renard to the Lebaudy Dirigible. The Most Recent Dirigibles—The Patrie—The City of Paris—Zeppellin—Parseval Dirigibles—The Wellman. The Problem of the Dirigibility of Balloons—Resistance of the Air on a Dirigible. General Study of the Shape of the Steerable Balloons—The Stability of a Steerable Balloon. Rolling and Pitching. Stability of a Dirigible Balloon in Movement. On the Evolution and Displacement of a Dirigible Balloon in the Horizontal Plane. Elements and Division on the Gas-Holder on an Elongated Balloon. Cutting out the Gas-Bags—Arrangement of the Other Parts of a Dirigible Balloon. Examination of the Condition which a Well Constructed Dirigible should Fulfill— Manoeuvers. English, German, French—Technical Dictionary.

Aviation Course: General Remarks—Aviation in Germany and America—Otto Lilienthal—O. Chanute—The Wright Brothers, 1904. Langley's Work—Hiram Maxim —Aviation in France. Aeroplanes—General Sketch—Description of Some Apparatus—Bleriot—Santos Dumont—Delagrange—Kress—Vuia. On the Resistance of the Air on an Aeroplane Surface—Lilienthal's Experiments—Center of Pressure. Theory of the Aeroplane without Motor—Theory of the Aeroplane with Motor. Necessity of Light Motors—Electric Carbonic Acid—Ammonia Motors—Water Cooled and Air Cooled Motors. On Screw Propellers—Wood and Metal Screws—Calculation of a Screw. Helicopters—General Remarks—Description of Some Systems. Ornithopters—General Remarks—Study of the Flight of Birds—Mixed Apparatus. Hydroplanes—Description of the First Experiments of Hydroplanes with Aquatic Propulsion—Hydroplanes with Aerial Propellers. How an Aviator can Construct His First Trial Apparatus—The Duty of the Aviator in the Trials. English, French, German—Technical Dictionary.

THE DIHEDRAL ANGLE IN KITES AND AEROPLANES.

By James Means.

Although the quotation given below was first published twelve years ago, and is known to most aviators, it has never had as wide a circulation as it deserves. It is timely now and is surely a gem of the first water.

As may be observed in the illustrations of Farman's motor-aeroplane and of Santos-Dumont's No. 19, which have appeared in recent issues of the leading illustrated papers, the two machines are radically different in design. As both were entered for

the Deutsch-Archdeacon prize, which has now been won by Farman, we have here an excellent opportunity to study the two principles which are depended upon for stability.

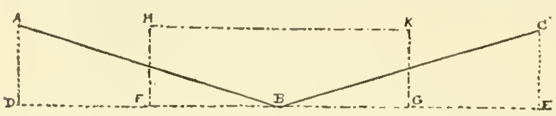
I think that all who have taken an interest in the subject of aviation have great respect for Lawrence Hargrave of New South Wales and admiration for his work. He is known all over the world as the inventor of the Hargrave kite. In looking at the illustration of the Farman machine we notice the superposition of the surfaces, the extremely obtuse angle of the same and the cellular structure of the tail. We see in Santos-Dumont's No. 19 that he is testing the dihedral angle principle of stability with a much less obtuse angle, and that he has (for the time being perhaps) abandoned the Hargrave cells which he used in his No. 14 about a year ago.

The following quotation from a paper read by Hargrave before the Royal Society of New South Wales, August 5th, 1896, will explain my meaning:

"As there is little doubt that the cellular is a permanent type of kite, a few remarks will be of interest; especially as its action and construction as hitherto explained are somewhat obscure. The first question that suggests itself, is, Why should the cellular lift more per square foot than the ordinary single-surfaced kite? In a kite or flying machine the distribution of the lifting surface is most important. The value of the lifting surface depends within certain limits on the linear dimension that first meets the wind. Thus, a common kite of 25 sq. ft. area cannot show more than about 7 ft. of edge to the wind, whereas a cellular one of 25 sq. ft. area can easily show 20 ft. of edge to the wind.

"The great stability of the cellular kite is due to the vertical surfaces. To understand this, it is necessary to grasp the truth, that a perfectly flat kite has no stability; and even with tail and side ropes is an inferior flyer. The more the kite bends back from the longitudinal center line or backbone, the more stable it becomes. The angle between the two sides is called by flying-machine men the dihedral angle, and without this or its equivalent, no flying apparatus will balance with any degree of certainty.

"In the figure, let A B C be the dihedral angle of a kite, B being the end view of the backbone. Resolve A B and B C into their components, and D B E is the breadth of surface that tends to lift the kite, and A D and C E are the heights of the surfaces that tend to steady it. Bisect D B and B E, and erect perpendiculars F H and G K equal to A D or C E; join H K; and F H K G is the breadth and height of a cell having the same lifting power as A B C and (apparently) greater stability.



"The width of the kite D E is halved, and therefore much less timbering spreads an equal area of lifting surface, to say nothing of the rigidity of the lattice girder construction.

"To realize this question of stability from another point of view, let us imagine a flying machine with lifting surfaces in the dihedral fashion A B C, and one with two cells like F H K G, to be on their respective stages, rails, carriages or floats, ready to fly; suppose them to have equal areas, weights, and wheel or other bases and to be heading directly to the wind; a momentary change of wind would promptly overturn A B C, but F H K G would only be pushed sideways."

I believe that I am rendering a service to all who are thinking of entering upon experiments in aviation in stating that Lawrence Hargrave has been very generous in placing the reports of his long-continued experiments in the leading public libraries of the United States. These reports may be found catalogued under his name as author or in "*The Journal and Proceedings of The Royal Society of New South Wales.*"

AERONAUTIC CALENDAR.

March.—Balloon race organized by the Aero Club of Nice. Distance race at Verona, Italy, on the 19th.

April 15.—Balloon race at Paris organized by the Aero Club of France.

May.—International balloon race in England organized by the Aero Club of the United Kingdom. International Aeronautic Congress at London. Balloon race of the Aero Club of France on May 16.

June 11.—Balloon contest of the Aero Club of France.

July.—Balloon race organized by the Aero Clubs de Brussels, Bordeaux and Tourcoing. Dirigible contests at Bretton Woods, N. H. On the 9th, 16th and 23d, flying machine contests at Spa.

September.—Grand Prix of the Aero Club of France at the Tuileries. Aeroplane contest at Vichy.

October 11.—Gordon Bennett International Race and other contests at Berlin (Tegel).

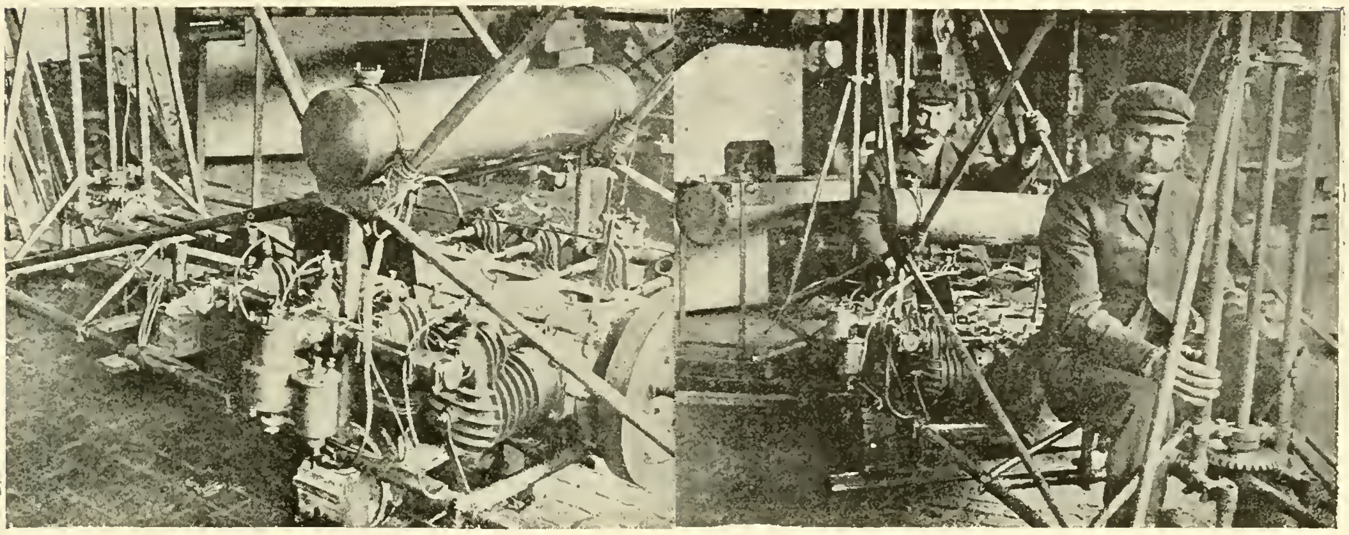
May 1, '08-'09.—Aeroplane contests with and without motor, at Munich Exposition.

1911.—International assembly of dirigibles in Italy, under the auspices of the Societa Aeronautica Italiana.

HELICOPTER JEAN BERTIN.

For some reason or other we hear of few helicopters and, no doubt, few are being constructed. It is interesting to note that no great success has ever been obtained with a direct lift machine, although there seems to be no good reason why such a system is not only practicable but, indeed, save for the added danger, the most convenient. The machine needs less space, it should rise into the air more quickly, and land in a shorter space.

A machine of this type has just been constructed by Bertin, but no flights have yet been made. In a rigid framework of steel tubing is placed a horizontal air cooled 8 cylinder, 115 mm x 125 mm., 150-horsepower motor, weighing only 120 kg., invented



TWO VIEWS OF THE BERTIN MACHINE.

by Bertin himself. It makes 2500 rpm. The power is transmitted through a disk clutch. Driven by bevel gears are two metal two-bladed propellers 2.8 metres in diameter, with blades 1.2m. by .75m. The propellers turn at 1250 rpm. In the front of the machine is another gear driven metal propeller .7m. in diameter turning at 2500 rpm., mounted on a shaft having a universal joint, and both steers and propels. The whole machine weighs but 310 kilograms, without counting the aviator who stands in the front part and the engineer in the rear at the motor. The first trials will be made with the vertical propellers—those on the vertical shaft—and later with the other. It is stated that at a preliminary trial the apparatus rose easily.

NEW AERO CLUBS.

Aero Club of Milwaukee.

Application has been made to the Secretary of State to incorporate the Aero Club of Milwaukee. The prime movers are William Woods Plankinton, Dr. A. R. Silverston and Major Henry B. Hersey, members of the Aero Club of America; William George Bruce, Secretary of the Merchants' and Manufacturers' Ass'n; Dr. J. F. Schrieber; Edwin Tower, Jr., Dr. S. D. Knapp, W. C. Kreul and R. B. Watrous, Secretary of the Citizens' Business League.

The intention is to organize under the wings of the Aero Club of America, which is the only club in this country recognized officially abroad. One club only in each country is admitted to membership in the International Aeronautic Federation and the Aero Club of America is the club representing America in this Federation.

At a meeting held to discuss the organization, Dr. Schreiber stated: "Milwaukee men must organize the body and conform it to the rules of the Aero Club of America, which will recognize us and promulgate the rules under which all the great contests of the world are held. This is the only way to assure clean sport when the time comes for Milwaukee to own its own aero grounds and assist in the development of aerial navigation. Nothing not done under the standard of rules of the Aero Club of America is recognized abroad, and it holds the sport up to as high a level as the American Automobile Association does its contests."

Three balloons are to be purchased in the near future, of varying sizes.

Club Aeronautique de Vincennes.

The Club Aeronautique de Vincennes, Secretary M. Rayac, has been formed to take an active part in the principles and sport of aerostation and aviation.

Societie des Anciens Aerostiers.

The Society of Ancient Military Aeronauts has been formed at 35 Rue Boissy-d'Anglais, Secretary M. L. Lemaire.

Hamburg Aero Club.

On February 17th the Aero Club of Hamburg was formed with 300 members. Professor Voller was elected president. The club was presented with a balloon by one member and with 3,000 marks by another.

AERO CLUB OF AMERICA.

It is gratifying to note that the attendance at the club on "club nights," Monday and Friday, has increased considerably during the last month.

Mr. Wilbur R. Kimball has been appointed vice-chairman of the Entertainment Committee and during the month three lectures were given. Mr. F. H. White illustrated a practical talk on ballooning with beautiful lantern slides made from negatives secured on some of his trips. Mr. Edward A. Durant lectured on the gyroscope and exhibited an interesting specimen driven by electric current. Mr. Kimball also gave an illustrated lecture with the aid of the lantern slides recently brought over from France by Mr. Albert C. Triaca.

On Monday evening, February 10, a general meeting was held, addressed by Messrs. Frank S. Lahm, Peter Cooper Hewitt, Albert C. Triaca and others. Considerable discussion followed looking towards greater activity in the club during the year. A number of members are building gliders and full-sized machines and the matter of an experiment station was considered and steps will probably be taken to secure the use of a race track near the city. An aviation section of the club was proposed and it is not unlikely that in the near future one will be inaugurated.

A club flag has been adopted and members are requested to adopt private signals and register them with the club.

Members are urged to register the names and particulars of their balloons with the club. They are also asked to display the club flag in ascents.

The Automobile Club of America some time ago invited the Aero Club members to dine at the Automobile Club on the first and third Tuesdays of every month, on which nights entertainments will be provided.

On February 21st, Mr. Albert C. Triaca entertained a goodly number of guests with a "smoke talk" at the Aeronautic School. Mr. Triaca showed some new lantern slides of the French military dirigibles and the aeroplanes practicing at Issy. At the conclusion of the talk the work of the school was discussed and the various models and instruments were exhibited.

Captain T. S. Baldwin was awarded pilot's license on March 2. With the hundreds of ascents to his credit it is a wonder he did not apply for it previously.

The annual banquet will be held at the St. Regis on Saturday evening, March 14th. The speakers will be: Hon. James M. Beck, Ex-Assistant U. S. District Attorney; Mecredy Sykes whom all will remember with pleasure as speaking at the last banquet; Professor A. Lawrence Rotch, Blue Hill Meteorological Observatory; Lieutenant Frank P. Lahm and Ex-Governor David R. Francis of Missouri. President Sherrick of the Aero Club of Ohio, will also be present and address the diners.

Following is a statement of the scheme for a national federation, together with a synopsis of the arrangements between the affiliated French clubs. It is to be very much regretted that there are but three clubs in America who have known actual legal being and it is obviously impossible to form a federation with mythical organizations. Most necessary it is to have a national organization to control the sporting side of the art and to standardize the requirements for the issuance of pilots' certificates; along the lines of the American Automobile Association.

"On account of the rapidly increasing number of aero clubs in the United States it is necessary that something be done to bring them into closer relations with one another.

"We believe that in order to keep the sport of aeronautics clean and as far as possible free from professionalism and commercialism, it is necessary that a uniform

standard should be established in order to put all the clubs on the same footing as regards matters which may effect the welfare of all of them.

"In Germany and France where there are a number of local clubs different systems have been put into operation. In France, where the situation is similar to that in this country, the Aero Club of France is the national society and as such represents France in the International Aeronautic Federation. In order that the local clubs shall be represented in this Federation, and for the purpose of establishing uniform rules regulating the sport, there has been in operation for several years a system of affiliation. Included in this system there were in 1907 six aero clubs affiliated with the Aero Club of France. The term of affiliation is one year and renewals are made on the first of January for the calendar year following. Attached hereto is a summary of the articles of agreement now in effect in France. It will be observed that the idea expressed throughout in these rules is that these clubs shall observe rules similar to those prevailing in the Aero Club of France regarding the issuance of pilots' licenses and as to details in the organization of aeronautical contests. The French affiliation agreement also contains provisions regarding granting of sanctions to aeronautical events organized by bodies other than the clubs included in the affiliation.

"In this country, the Aero Club of America believes the present high standard of aeronautics should be maintained and, therefore, it will not permit societies whose requirements are less than those of the Aero Club of America to affiliate with it. After carefully considering the matter, it has been decided to invite as the first members in this affiliation the Aero Club of St. Louis, the Aero Club of New England, the Aero Club of Ohio and the Aero Club of Philadelphia. From what has been learned of these clubs we feel certain that they are in entire sympathy with the purposes for which the Aero Club of America was founded and are willing to insist on the same standard of conduct on the part of their members.

"There are many details of this arrangement to be settled in accordance with the ideas of the several clubs mentioned, and, understanding as we do that the clubs mentioned are willing to affiliate with the Aero Club of America, it is desirable that a conference be held to consider the form of articles of agreement.

"It is not our purpose to extend this affiliation at present, but we suggest that a governing committee of the affiliated clubs should be formed with the idea of passing upon applications for affiliation from other clubs. If this affiliation is carried out to a definite organization, the Aero Club of America will consider that it is the organ of these clubs in regard to all matters requiring international agreement. As is well known, the Aero Club of America is the sole representative of America in the International Aeronautic Federation, and because of this is bound to apply, in all matters connected with the sport of aeronautics, the international rules established by that Federation. These rules are very complete and are so drawn that they provide for all contingencies in conducting aeronautical contests.

"The right to enter contestants or competitors for any international aeronautical event is vested in the Aero Club of America, and the Aero Club of America will be glad to make entries for its affiliated clubs in international events as may seem expedient in each case. We feel that rules governing the sport of aeronautics in this country must be kept at the highest possible standard, and unless the other aero clubs unite with us in maintaining these rules the sport is sure to become professional.

"We feel that the occasion now presented for affiliation is opportune and should be carried into effect at once before the increasing number of aero clubs in this country make the task more difficult."

(Signed.) CORTLANDT F. BISHOP,
President.

Synopsis of Affiliation Agreement of French Aeronautical Organizations with the Aero Club of France.

Art. 1. During the year 1907 there were six aero clubs affiliated with the Aero Club of France; two at Paris, one at Nice, one at Roubaix, one at Bordeaux and one at Troyes. The term of each affiliation is one year and is renewed on the first of January of each year for the year following.

Art. 2. Members of the affiliated societies alone are allowed to take part in the annual or occasional contests organized by the Aero Club of France, and only members of these affiliated clubs are admitted to the international contests of the Federation, whether they take place in France or in a foreign country.

Art. 3. Members of these affiliated clubs are also relieved of any tax which is charged for non-members of the Aero Club of France making ascensions from the Aero Club's grounds at Paris. Members of affiliated clubs may also obtain pilots' licenses under the same conditions as members of the Aero Club of France.

Art 4. The presidents of affiliated societies can become members of the Aero Club of France without paying the initiation fee.

Art. 5. Members of the affiliated societies *receive free copies of the official publication of the Aero Club of France,* and also receive copies of the various rules, records, programs, etc., without cost.

Art. 7. The Aero Club of France gives various privileges and prizes for contests organized by these affiliated societies.

Art. 8. Pilots named by an affiliated society, although not pilots of the Aero Club of France, can take part in the various contests organized by the International Federation or by the Aero Club of France.

Art. 9. Members of affiliated societies are only allowed to compete in contests arranged by the Aero Club of France, the affiliated societies, or by persons or societies who have received licenses from the Aero Club of France, and by the International Aeronautic Federation.

Art. 10. Members of affiliated societies are bound in all respects to observe the racing rules made by the International Aeronautic Federation and by the Aero Club of France, and are also to correspond with no society not recognized by the Aero Club of France or by the International Aeronautic Federation, and are to take part in no contests other than those arranged by the Aero Club of France, or societies affiliated to it, or the International Aeronautic Federation, and also all pilots' licenses given by affiliated clubs must be granted under the same conditions as those granted by the Aero Club of France.

Art. 11. Affiliated societies shall give gratuitously to the Aero Club of France and to the other affiliated clubs free copies of all publications and news of the Club. Every aeronautical society in the affiliation must advise the Aero Club of France and the other affiliated societies of all changes in by-laws, officers and government, and in case they unite with any other society.

Art. 12. Members expelled from any of the affiliated societies cannot become members of the Aero Club of France or of any of the other affiliated societies. No members of any affiliated society dropped for non-payment of dues can become a member of any of the other affiliated societies without first paying up arrears in the society to which he is indebted.

Art. 13. Each affiliated society, regardless of the number of members, must pay yearly dues to the Aero Club of France of $12 per year. The dues are payable on the first of January of each year, and if they are not paid within thirty days the Club owing them is expelled from the Federation without notice.

Art. 14. In order to join this federation of French clubs the Club wishing to join must send to the Aero Club of France a written request, together with a copy of its Constitution and By-Laws, copy of its certificate of incorporation, list of pilots, officers, address, etc., and must deposit the annual dues which are returned if the Club is not accepted.

Art. 15. A society having ceased connection with the federation and desiring to again become affiliated must apply for membership the same as if they never were affiliated.

Art. 16. The Governors of the Aero Club of France may give sanctions to any aeronautic contest of which the rules in no way conflict with the rules of the International Aeronautic Federation. The taxes for a meeting of this sort are as follows: For challenge cup—contest by balloons or flying machines—$10.00 each license. For special contests a tax of $2.00.

Art. 18. The Governors of the Aero Club of France are at liberty to punish by fine or otherwise violation of the racing rules of the federation or of the International Aeronautic Federation, and judges to impose this penalty must be two Governors of the Aero Club of France with two Governors of other aero clubs in the federation.

Art. 19. Provides for filing of protests to the Aero Club of France. The Aero Club of France can also proceed in these matters of its own initiative, and the tribunal thus constituted decides questions without appeal.

Art. 20. Provides that no changes shall be made in the rules during any one year except as a result of trial by a committee provided for in rule No. 18.

AERO CLUB OF NEW ENGLAND.

The first social meeting of the Aero Club of New England was held at the house of Dr. Maurice H. Richardson, one of the most eminent surgeons in Boston, on Wednesday evening, February 26th.

The President, Professor A. Lawrence Rotch, gave an illustrated lecture on the "History and Development of Ballooning." Professor Rotch pointed out that Bostonians had always been interested in ballooning, since Benjamin Franklin had described in detail the first balloon ascension from Paris, and Dr. John Jeffries, a Harvard College graduate residing in London, had made the first balloon voyage for scientific purposes in 1784, only a year after the balloon was invented. Professor Rotch described

the use of balloons for obtaining meteorological observations and especially those got by his own observatory with registration balloons at great heights above the American continent and over the Atlantic Ocean. The development of the motor balloon, since the first successful dirigible balloon of Major Renard in 1885, was pictured, as was the sport of balloon racing, which began during the Paris Exposition of 1900.

Mr. H. H. Clayton continued this subject by giving an illustrated account of his balloon voyage from St. Louis to the Atlantic, which is printed in the March issue of the "Atlantic Monthly" magazine.

ASCENSIONS.

Jan. 28.—Lieut. Frank P. Lahm (Aero Club of America), Herbert W. Alden and J. G. Obermeier (Aero Club of Ohio), in the "Ohio" from Canton at 1:15 P. M., landing at 3:35, twelve miles from Oil City, Pa., a distance of about 100 miles in a straight line. Most of the trip was above the low mist clouds. In ascending, the anchor caught in some wires which had to be cut. During inflation, in order to arrange the valve rope, the balloon was pulled down quite close, and Lieutenant Lahm got under the balloon. A flow of gas came from the neck, and the Lieutenant was nearly axphyxiated.

Feb. 22.—Leo Stevens and A. Holland Forbes (Aero Club of America), in the "Stevens 21," from North Adams, at 1:18 P. M., landing at 3:48 at Wales, near Palmer, Mass. The gas furnished was exceptionally light. Distance, about 65 miles. The cold was intense, freezing the ballast, water and even the ink in one of the registering instruments. Just after crossing the mountain near North Adams a snowstorm was encountered. On going up to an altitude of 13,000 feet the temperature seemed to be a little higher. When a landing place was looked for, none was in sight. For ten miles no suitable spot could be found. At last a narrow wood-road was sighted in the midst of the forest. The anchor was thrown just before reaching the spot and the balloon settled down, plumb in the middle of the road, as easily as a bird alights. So much for skill! The balloon was all packed up when a farmer came along with a wagon and drove the party to Palmer, where they spent the night.

ARMY AERONAUTICS FOR FEBRUARY.

TWIN SCREW DIRIGIBLE OF CAPT. BALDWIN.

On February 8th the Secretary of War approved the recommendation of the Board of Ordnance and Fortification and award has already been made for three flying machines of the aeroplane type, as follows: J. F. Scott, of Chicago, price,

$1,000, time of delivery, 185 days; A. M. Herring, of New York, price $20,000, time of delivery, 180 days; Wright Brothers, of Dayton, Ohio, price, $25,000, time of delivery, 200 days.

On February 15th proposals for dirigible balloons of two-passenger size were opened. Eleven proposals were received. Award has been made to Captain Thos. F. Baldwin, of New York, price, $6,750; time of delivery, 150 days.

The length of the envelope will be 84 feet, diameter 16 feet, capacity 17,000 cubic feet. The frame of rectangular cross section, will be 65 feet long. The motor will be a specially designed Curtiss, 30 horsepower, 4 cycle, 4 cylinder

THE TWIN SCREW IN FLIGHT AT HAMMONDSPORT.

(vertical), water cooled, with Magneto ignition, cast-iron cylinders, copper-jacketed. The crank case will be of aluminum and McAdamite; shaft 4-throw, hollow Vanadium steel. The bearings are Parsons "white brass." The weight is estimated approximately at 200 pounds. Enough fuel will be carried for a flight of two hours. The feature of the ship will be the double propellers.

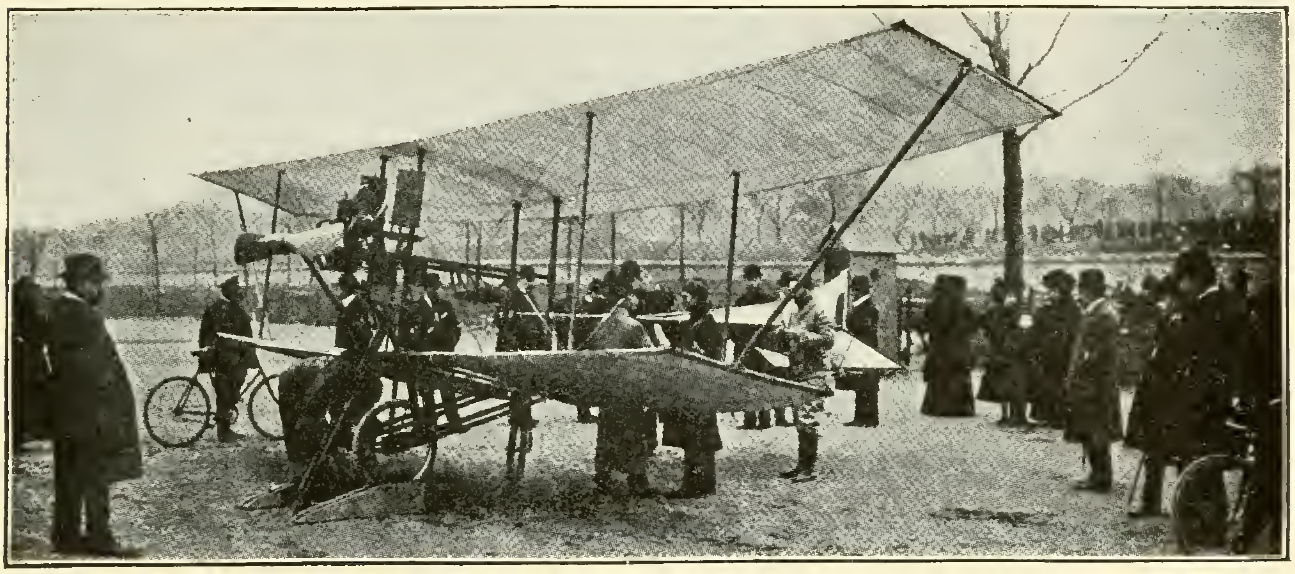
The Signal Corps balloon detachment was transferred from Fort Wood to Fort Myer during the month, and is now engaged in overhauling and repairing all Signal Corps aeronautical equipment at the balloon house at Fort Myer, under the direction of Lieut. F. P. Lahm of the Signal Corps.

PARIS FLYING.

During February there has been a lull in the flying at Issy. The Pischoff machine has not been out since the first few flights. At the time it seemed to have too little stability. However, the aviator was able to accomplish jumps of 30, 40 and 80 metres. The first week in February he experimented with his aeroplane and met with rather a serious setback. He was speeding at a moderate pace and his apparatus was about to rise when a wheel fell off and rolled away. The machine turned completely over and sustained considerable damage. It will be repaired as fast as possible.

On February 3rd Delegrange practiced with his new machine, No. 2, at Bagatelle. While traveling at a rapid rate on the ground one of the propeller blades snapped off and cracked the crank case. A feature of the machine is the tubular radiator carried in front of the main supporting surfaces and immediately ahead of the aviator, while the motor is at his back with the propeller behind that. No damage was done to the aeroplane.

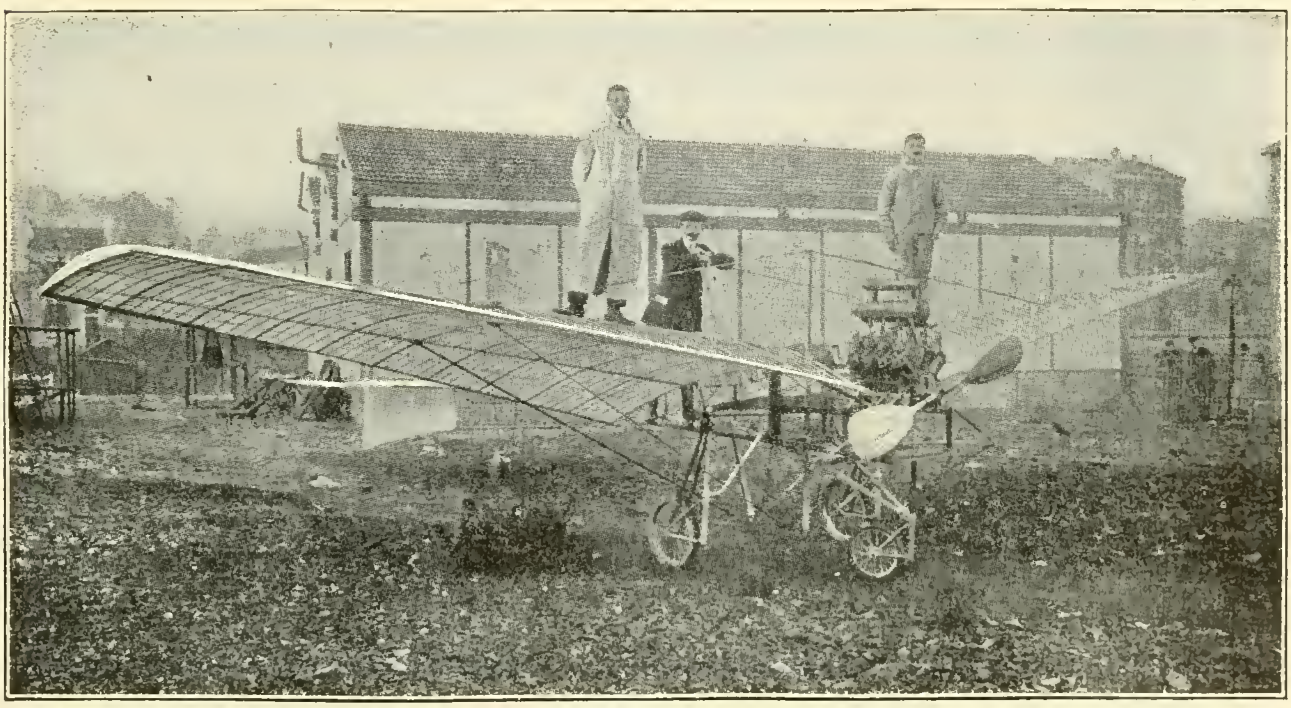
The Gastambide-Mengin monoplane made its first trial on the 8th. The machine had risen about 5 metres and progressed horizontally about as far when it started to



THE PISCHOFF AEROPLANE.

capsize. The driver, Boyer, saw the movement and shut off the power just in time.

On the 12th it was again brought out and made short runs in the Bois de Boulogne. The machine seemed to behave very well. At the first trial it made a distance of 60 metres at a height of 6 metres. To avoid a clump of bushes a quick turn was given the rudder and the machine came down. One wheel struck an obstruction and the machine turned over. M. Boyer, the aviator, was uninjured. Considerable damage was



GASTAMBIDE—MENGIN.

done. The general impression concerning the Gastambide aeroplane is that a similar accident will happen regularly as long as the constructors refuse to fit a horizontal rudder or headpiece, whereby the height and angle of the machine may be controlled when in the air. With the aeroplane, as it was yesterday, once the ground has been left the only means possessed by the driver to control the upward and downward movement is the motor.

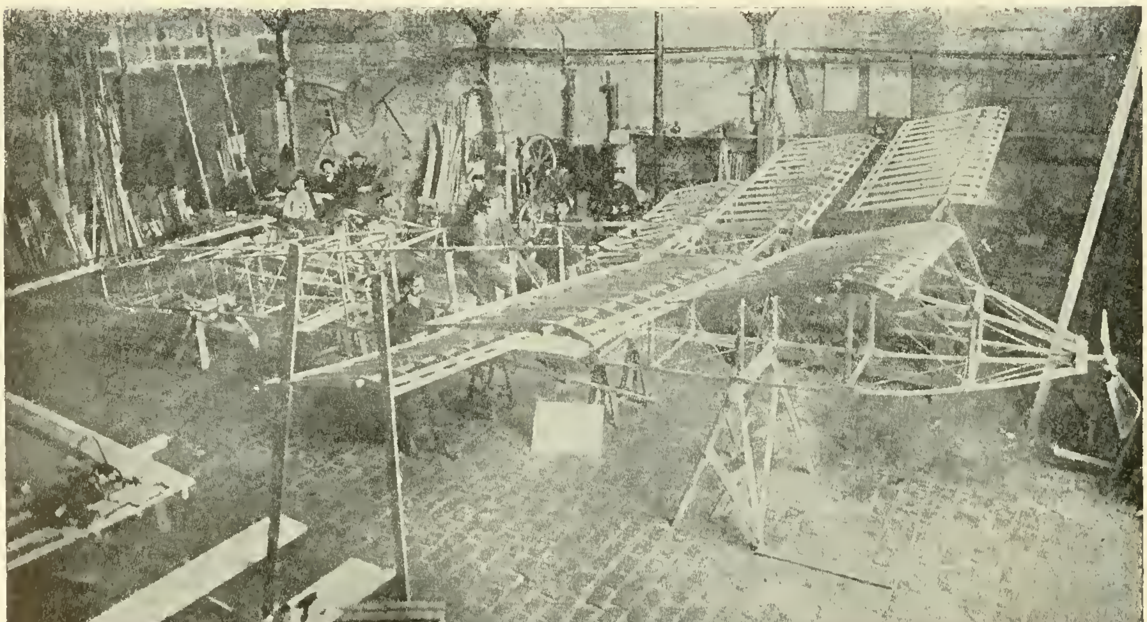
The Farman No. 1 has been re-covered with "Continental" rubber-silk. An air-cooled Renault motor has taken the place of the Antoinette heretofore used.

Pelteric is building another monoplane, to be ready in six weeks. The motor will, of course, be the R. E. P.—7 cylinders, 35 horsepower, 52 kilograms weight. In the

THE GASTAMBIDE—MENGIN IN FLIGHT.

No. 1 machine the lateral equilibrium was very good. In the No. 2 he has sought to improve the longitudinal stability, so that it will not dive. In the first machine he accomplished fully 50 flights inside of two months.

THE FARMAN II.

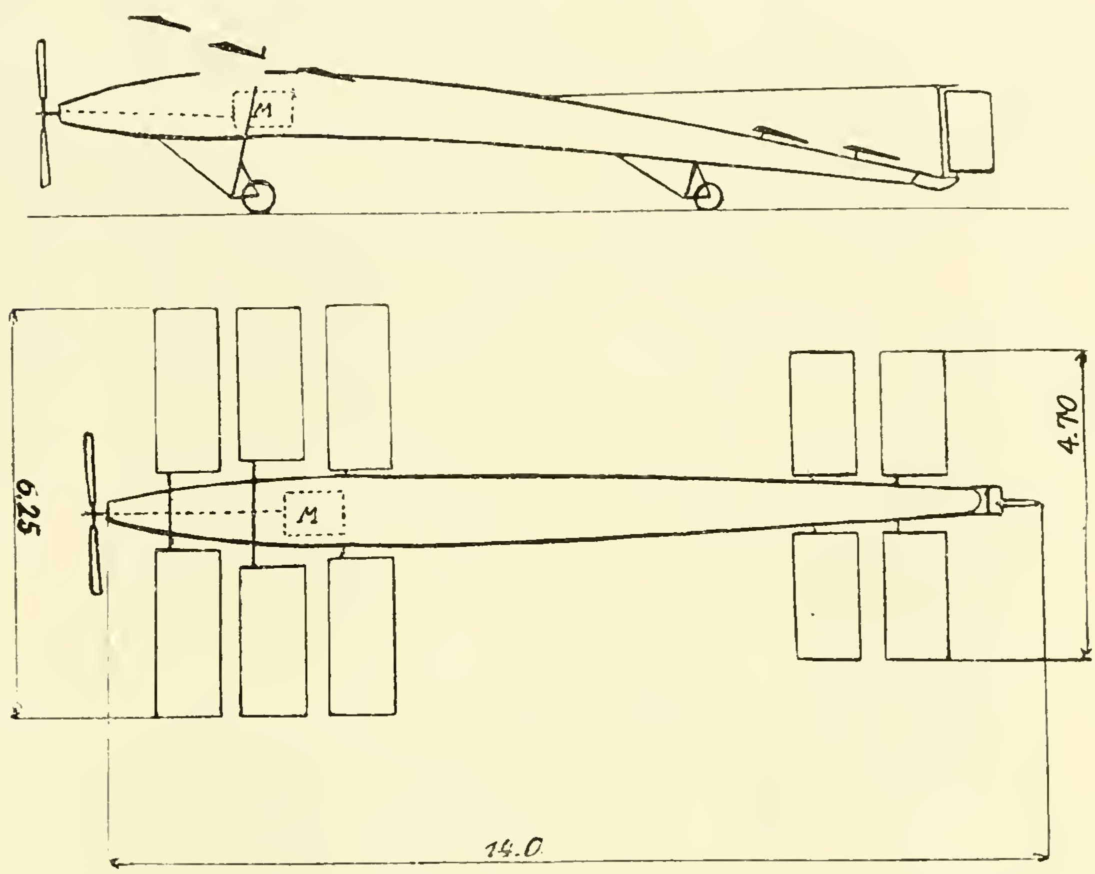


THE FARMAN II, "FLYING FISH."

The Farman No. 2, of a modified Langley type, is in course of construction. It has five pairs of wings, three in front and two in the rear on each side of the fusiform

body, at different levels. The body is 14 metres long, the spread of the planes in front 6.25 metres, that is, the total width of the machine across the front surfaces. The rear planes measure 4.7 metres across.

The rear plane pivots about a transverse axis passing through the center of pressure and acts as a horizontal rudder. There is also a vertical plane in the extreme



rear. The total surface is about 45 square metres, and the approximate weight 600 kilograms. The screw has a diameter of 2.5 metres and is actuated by a 35-horsepower Renault Motor. The whole is mounted on a three-wheeled chassis. The exact dimensions are not available.

A flying machine modelled on the principle of the natural flight of certain birds, such as the woodcock, the skylark and the humming bird, whose ascent from the ground is perpendicular, is the latest thing in English aeronautics. For thirty years the inventor has been studying the flight of birds, and even winged insects, in different parts of the country, and in all manner of circumstances. He has christened his invention "The Aeroway." It consists of a wheel called a "feathering propeller," capable of making many thousands of revolutions a minute the circumference of which is fitted with fans, which open and shut as the wheel revolves.

"My wheel," says the inventor, "does in the air what the paddle wheel does in the water—and more. I have discovered that no bird or insect can raise itself perpendicularly by the power that is derived solely from the wings striking the air. When a bird ascends perpendicularly the action of the wings creates a partial vacuum or suction above its body and an upward compressed air movement underneath. On that discovery my wheel is modelled. It continuously collects and carries the air by vanes or blades about seven feet wide over one-half the circumference and compresses the air by the plane contracting to about two inches over the other half. Thus I secure for my flying machine more than double the lifting power of the bird, whose wings must necessarily follow a reciprocating movement. When an inventor has conquered the problem of perpendicular flight—and I believe I have—he has conquered all, for mere gliding horizontally in the air is a secondary matter when the machine is well up from the ground."—*Boston Transcript.*

AERONAUTIC RECORDS.

Aerostation.

FREE BALLOONS.

World's Distance Record.—1,193 miles, made by Counts Henry de la Vaulx and Castillion de Saint Victor, Vincennes, France, to Korostychew, Russia, in 35¾ hours, Oct. 9-11, 1900.

U. S. Distance Record (Second Best in the World).—872¼ miles, made by Oscar Erbsloh and H. H. Clayton, St. Louis, Mo., to Asbury Park, N. J., in 40 hours, Oct. 21-23, 1907.

World's Duration Record.—52 hours,* made by Drs. Kurt and Alfred Wegener April 5-7, 1906. Reinickendorf, near Berlin, Germany, to the north of Denmark and back to Laufach, Germany, 708 miles by path, 249 miles in airline between points.

U. S. Duration Record (Second Best in the World).—44 hours, made by Alfred Leblanc and E. W. Mix, St. Louis, Mo., to Herbertsville, N. J., 867 miles, Oct. 21-23, 1907.

World's Altitude Record.—37,000 feet, claimed by James Glaisher, Sept. 5, 1862. This, however, is doubted, and the record acceded to Professors Berson and Süring of the Berliner V. f. L., who reached an altitude of 34,000 feet.

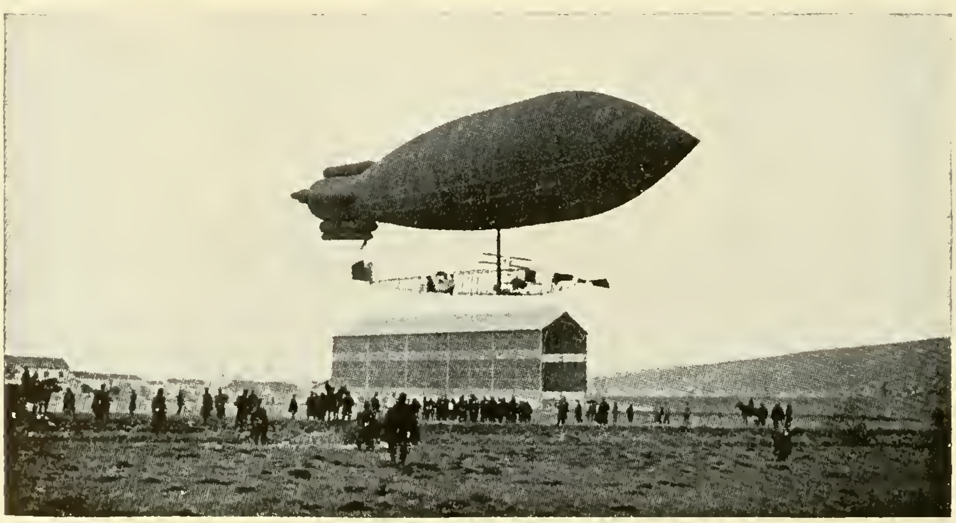
DIRIGIBLE BALLOONS.

World's Distance Record.—211.36 miles,* made by the "Zeppelin III" Sept. 30, 1907, flight lasting 7 hours, starting from and returning to Manzell on Lake Constance.

World's Speed Record.—30.22 miles per hour, attained in above flight.

ZEPPELIN III.

World's Duration Record.—8 hours 13 minutes, made by "La Ville de Paris" on trip from Paris to Verdun Jan. 15, 1908. The corrected distance travelled, 161.56 miles.

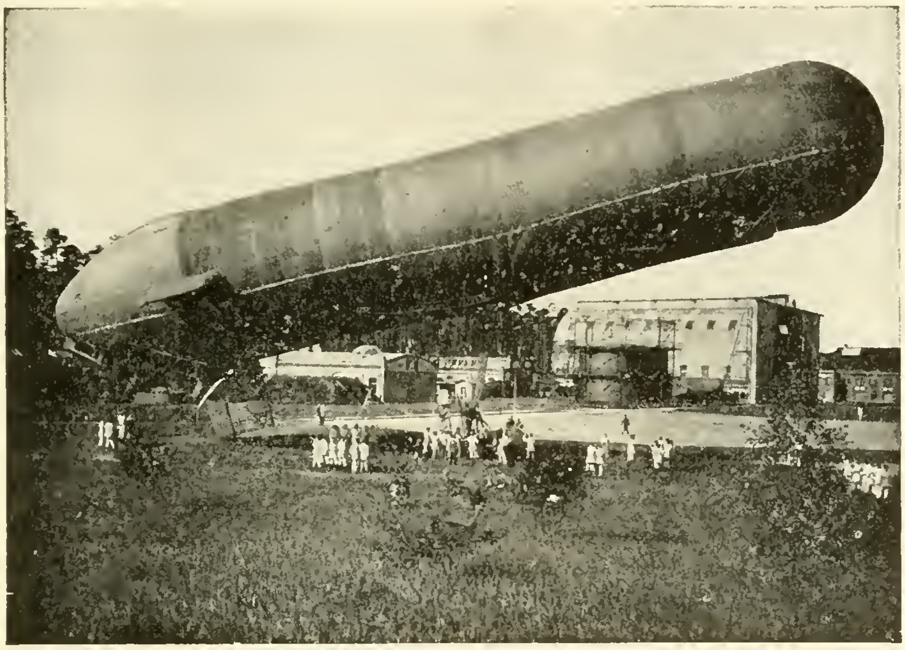


VILLE DE PARIS.

The total length of the ascension was 9 hours 38 minutes. To obtain the time during which the airship was in forward motion, deduct 67 minutes covering ascending and

descending manoeuvres from the 8 hours 13 minutes, leaving 7 hours 6 minutes. Speed per hour based on the latter time is 22.75 miles.

The previous duration record without pause was 8 hours 10 minutes, made by the "Gross-Bazenoch" Oct. 28, 1907. The "Parseval" on the same day made an ascension lasting 7 hours 30 minutes, from which is to be deducted 1 hour 5 minutes for two stops, leaving actual time in motion 6 hours 25 minutes.



THE 1906 PARSEVAL.

The French record for distance and duration *without stop* is held by "La Patrie" on account of trip from Chalais to Verdun on Nov. 23, 1907, 146.64 miles in 6 hours 45 minutes. The speed recorded in this flight, 21.195 miles per hour.

World's Altitude Record.—4,510 feet, made by "Lebaudy" on Nov. 10, 1905.

LA PATRIE.

Aviation.

World's Distance and Duration Record.—24 1/5 miles* in 38 min. 3 sec., made by Wright Bros., Dayton, O., Oct. 5, 1905, in an aeroplane. The next best record is that of Henry Farman, whose flight of 1 kilometre (.62137 mile), in a circle, in 1 min. 28 secs., won the Deutsch-Archdeacon $10,000 prize on Jan. 13, 1908.

The figures starred (*) are not "official" in that the flights have not been made under the control of any club belonging to the F. A. I.

GORDON BENNETT, 1908.

Twenty-three entries, representing eight nations, have been received by the D. L. V. in the G-B race from Tegel on Oct. 11. The United States, Germany, Belgium, England, France, Italy and Spain three balloons each; Switzerland two.

INFLATING, GORDON BENNETT ST. LOUIS.

This will be the first time that the Swiss club has entered an international race. The English representatives will be John Dunville, Prof. A. K. Huntington and the Hon. C. S. Rolls. Belgium has entered the "Belgica," 1680 cu. m. (pilot, M. Demoor); and the "Ville de Bruxelles," 2200 cu. m. (pilot, M. Leon de Brouckere). The third champion will probably be named by the Aero Club des Flandres, an affiliated club of the Aero Club de Belgique. The "Belgica" will be a new balloon from the Mallet atelier.

READY TO START, CROWD LOOKING AT PROF. ROTCH'S PILOT BALLOON.

As it is impossible to inflate twenty-three balloons at Tegel, either the balloons will have to be started on following days or else started from various nearby cities. A communication has been forwarded the Deutscher Luftschiffer Verband by the Aero Club of America to the effect that America will be pleased to have the race at St. Louis again this year. This is entirely possible under the rules, for, if a winning club cannot hold the contest the following year, it reverts to the previous holding club to handle the race.

Spa Aviation.

An aviation contest will be held at Spa, Belgium, on the three Sundays, July 9, 16 and 23, at the Sauveniere race course, which is 2300 meters around. The first ten dates are for speed trials. A kilometer circuit is the trial for the first day, a figure eight on the second and for the third day a large prize is offered for the ten times circling of

the track, or 23 kilometers. The total of prizes amounts to $15,000. The expenses of the aviators will be paid.

Aviation at Dieppe.

It is possible that aviation contests will be held at Dieppe at the time of the Grand Prix automobile race. Several of the aviators have visited the neighborhood and looked over the ground.

If the Dieppe contest is arranged there may be a race between Pelterie and Farman. Pelterie has taken up Farman's challenge and will race under any conditions the latter may name. Both are building new machines.

Munich Exposition, May 1, 1908, to May 1, 1909.

An international aeronautic contest will be held during this year at Munich. A prize of $2,500 will be given to the aviator who is able to stay in the air 10 minutes over a specified place, about 500 by 1000 meters in size, and be able to land by himself at the end of that time. Entries must have been received by March 1st, accompanied by a description of the apparatus or photograph, and fee of $50.

There will also be a model exhibition. The carrying surface of the models will have to be at least 1 sq. meter and not more than 2 sq. meters at the most. The total weight of the model must be at least (not more than?) 5 kg. per sq. m. of surface. There is no limit of weight for the motor driven models. The tests will take place in a convenient place selected by the Committee. To be considered worthy of a prize, models will have to cover at least 15 m. in a line from the starting point, which will be 2 m. above the ground. Three trials may be made. The competitors must be willing to exhibit their models to the public. Those machines which do not come within the specifications will not be barred from making public demonstrations, however.

Flying Machine Competition at Vichy.

It is likely that plans for a competition at Vichy during the Summer will be arranged. The Automobile Club has offered a prize of $4,000 to the winner, in addition to which, every aviator completing the course will receive $200. A Committee of the Ae. C. F., Messrs. Pelterie, Archdeacon and Farman, visited Vichy and found that though the race track would not be suitable there was an admirable large field on which a couse 500 meters in length could be laid out. The Ae. C. F. was asked to arrange the program. *Les Sports* will also offer a commemorative medal to the winner.

First American Aviation Bet.

On March 2, Otto Luyties, of Baltimore, bet Wilbur R. Kimball, New York, $100 that he (Mr. Luyties) will lift his helicoptere into the air four weeks before Mr. Kimball. It is understood that the machines must be lifted into the air at least 10 feet, or fly through the air any distance above the earth, for at least 50 feet. Each bettor must operate his own machine in the trial. The checks were deposited with Captain Thos. S. Baldwin.

Both Messrs. Kimball and Luyties are staunch supporters of the type helicoptere and will shortly have their machines ready for trial.

Junior Aero Club of the U. S.—Triaca Model Prize.

On Washington's Birthday a kite flying competition was held at Fort George, at the northern end of Manhattan Island. Many members of the Aero Club of America were present to watch the boys and to assist them with advice and aid in operation.

Messrs. Kimball and Triaca addressed the boys at the Y. M. C. A. on 23rd Street on February 29th.

Albert C. Triaca, Director of the International Aeronautic School recently established in New York, has offered a prize of $100 to the model which shows the greatest merit at a competition during the Summer. The models may be with or without motors. The competition is open to members of the Club and the Aeronautic School without fee. To others the entrance fee will be $1.00.

German Military Aeroplane.

An aeroplane is under construction along the plans of Professor Suering of the Prussian Meteorological Institute and on completion, which will be in the near future, will be tried out at Tegel.

Lieutenant Coanda, of the Prussian army, is credited with having constructed an aeroplane with which he has made sensational secret flights recently.

Toboggan-Flying Machine, a New Winter Sport.

Mrs. Carl E. Myers, wife of Carl E. Myers of the "Balloon Farm" at Frankfort, N. Y., has designed and experimented with a "toboggan-flying machine" which attains initial speed by gliding swiftly down a steep icy slope, ending in an abrupt rise at

the bottom, flinging the craft upward, at which moment the changing angle and air resistance together extend folded aeroplane wings on each side. It first soars under the impulse or momentum and then falls by gravity a long distance down the slope to a safe ending slide on the crust of the snow.

The toboggan has automatic equilibrium, or is so balanced by the rider's weight that any disposition to capsize is self-adjusted by the counter-balancing wings and by movements of the reclining body, or of any member, that by a sort of mechanical instinct it recovers position instantly, like a gliding skater on ice.

Based on this machine, Mr. Myers has arranged to build a power propelled machine. With a 2-cyl., 7-h.p. motor of 150 lbs. weight he has succeeded in obtaining a thrust of 66 lbs., which implies self support of its motive power in a vertical effort.

Aeronautic "Trust" in France.

On January 20 a meeting was held at the Automobile Club of France to discuss the advisability of combining the aeronautic trades in an association. At the second meeting on January 29th, the "Syndicate of the Aeronautical Industries" was formed. The four divisions at present are: manufacturers of flying machines; manufacturers of airships; trades connected with the manufacture of engines, propellers, etc.; the allied trades connected with the manufacture of material applicable to aeronautics. The object is to advance the industrial side and to hold competitions for light motors. It corresponds closely to our own Association of Licensed Automobile Manufacturers. For the year 1908 the following officers have been elected:

President, Marquis Albert de Dion; Vice-Presidents, Maurice Mallet, Louis Godard, Louis Bleriot; Secretary, George Besancon; Recording Secretary, M. Chauviere; Treasurer, R. E. Pelterie.

A Military Dirigible for Russia.

To be built by the Signal Corps from their own designs entirely of Russian material. It is expected to be completed by September. It will carry five passengers.

Wild Dirigible Afire in Mid-Air.

Lincoln Beachy and Horace Wild have been at the Jacksonville Exposition during February. Beachy made several good flights and Wild, one. On Wild's second flight, at the height of a hundred feet, gasoline leaking from the connecting hose caught fire. Wild quickly started the ship to the ground and tried to hold the bag away from the flames. He reached the ground safely but the bag was completely consumed.

Larger Dirigible for the French Army.

The French War Office has requested Messrs. Lebaudy to prepare plans and construct a larger dirigible than they have heretofore built. The length is to be 100 meters, diameter 11.5 meters, capacity 7000 to 8000 cubic meters. Two lifting screws are said to be intended for the purpose of obtaining special stability and forward motion will be caused by two screws each having its 120-horsepower motor. The speed estimated is 60 kilometers an hour. The Patrie was only 82 meters long and 10.3 meters in diameter.

The Lesson of La Patrie.

The disappearance of Patrie has caused discussion of means for the securing of dirigibles. Captain Ferber has said in *Aerophile* that it is very important that something should be done for the fastening of dirigibles, such as the sailors use in anchoring their ships. An anchor is cast whose chain is tied to the bow of the ship, allowing the boat to have always its nose into the wind and tide, which position presents the least possible surface to currents. The boat swings and it is quite important that the dirigible be allowed to swing also. Moreover, there is another danger of which sailors are afraid. When they are too near the coast at anchor the oblique action of the chain would cause the boat to touch the bottom with the up-and-down motion of the waves. A dirigible, held by one anchor, whatever the length of the rope may be, would always bounce on the ground. Captain Ferber suggests that it should be tied to an aerial buoy high enough so it could not touch the ground. The buoy should be light enough to be carried by the dirigible and made of a cone of silk, the same as used in balloons, of 7 or 8 meters high by 2 meters in diameter at the bottom. This would be inflated at the time of landing by means of the ventilator of the airship. The top of the cone would have a steel circle on which would slide the rope from the dirigible. The cone might have three ropes to attach it firmly to the ground. The cost, it is estimated, would not be over $200 and by being provided with such an arrangement it would be certain that the aerial vessels would not be at the mercy of the wind.

It will be remembered, that when Patrie broke away it jumped up and down on the ground by the force of the wind and it was impossible to reach the valve for fear of being struck by the straining framework.

Hydrogen at the Cost of Coal Gas.

A new sensation is at this moment exciting aeronauts. It is nothing less than the possibility of utilizing hydrogen in place of illuminating gas. A newly formed company is to erect a plant adjacent to the Aero Club's park at St. Cloud and supply the hydrogen at 20 centimes (4 cents) a cubic meter. Compressed in tubes it will be sold at 10 cents a cubic meter. The company will have a monopoly for France. The plant will be finished by the 15th of June.

The Pyrenees Cup of M. Deutsch.

On January 22, 1906, Fernando Duro won the cup offered by Baron Deutsch de la Meurthe. If not won again within two years it was to have become his property. The trip was made from Pau in the balloon *Cierzo*, of 1600 cu. m., at 4 o'clock in the afternoon. At midnight the aeronaut was over Madrid and at 6 in the morning of the 23rd the landing was made at Gaudix just apposite the Sierra Nevada range on the shore of the Mediterranean. It would have been perilous to have attempted to cross this range with the sea on the other side. Unfortunately, M. Duro is not to receive the cup in his actual possession for he died of fever on August 9, 1906. The cup will be held by the Royal Aero Club of Spain which now has his other trophies.

Transatlantic Balloon Voyage.

Jacques Faure, a prominent French aeronaut, is planning to cross the ocean in a balloon, starting from New York, and is looking for financial backing. He thinks that an aeronaut would find a steady air current at a moderate height which would give an average speed of sixty miles an hour. M. Faure has made nearly 200 ascensions.

February Incorporations.

"Federation of American Aero Clubs" to promote aeronautics; incorporators, C. A. Coey, M. M. Bear, C. E. Gregory.

"Hot Springs Airship Co.," capital $50,000, of which $7,900 is claimed to have been subscribed; incorporators, Dr. W. H. Connell, W. J. Westmoreland and Joe T. Rice. The company intends to construct an airship after the model patented by Rice.

Germany's Aerial Fleet.

It is freely asserted in Germany that England is far behind in the race for aerial supremacy, and the comments made here on Nulli Secundus and her achievements are the reverse of flattering. Germany is applying herself to the question of aerial warfare with the keenest interest.

At present the German War Office possesses one airship, constructed by Major Gross, which has a capacity of about 2000 cubic meters. Another airship of the same type, but embodying such improvements as appear desirable in the light of the practical experience gained by experiments made with the present type, is now being constructed at the military ballooning works at Tegel, near Berlin. The capacity of the new airship will be about 5000 cubic meters, and it will be provided with two motors, each of which will develop 75 h.p. This airship will be ready for active service in April or May. The work of construction is conducted with great secrecy, and no strangers are allowed to approach the shed in which it is concealed. Another airship is being constructed for the German War Office by Messrs. Siemens and Schuckert at their works in Berlin. The cubic capacity of this airship will be about 3000 cubic meters, and it will also be fitted with two motors.

The military authorities also intend to purchase Count Zeppelin's present airship, as well as the one which he is now constructing on the shores of Lake Constance. The Budget Committee of the Reichstag has just votd a sum of £100,000 as a donation to Count Zeppelin, in recognition of his eminent services to the Fatherland, rendered by the invention and construction of his airship, and this proof of official approval and support will be followed by the purchase of the two Zeppelin navigable balloons. The decision to purchase them has not yet been officially made known, and the military authorities will, if course, inspect the new airship before taking it over; but these measures are regarded as mere formalities.

The present Zeppelin airship has a capacity of about 12,000 cubic meters, and the new Zeppelin airship will have a capacity of about 16,000 cubic meters. The new airship will be supplied with two motors, each developing 85-h.p., and it is expected that it will attain a speed of 50 kilometers an hour. These two airships, together with the two now being constructed at Berlin and Tegel respectively, and the one already in use, will form the nucleus of Germany's aerial fleet. German experts are somewhat reserved in expressing opinions regarding the possibility of dropping explosives from airships, but there is a general tendency to believe that the difficulties which now present themselves in this respect will be removed as improvements are made in the construction of airships and as more experience is gained in using them for military purposes. Meanwhile, it is freely acknowledged that they will be extremely valuable for purposes of obser-

vation, especially as wireless telegraphy apparatus can be carried on board without difficulty or inconvenience. London Standard, Feb. 10.

The Brothers Wright and the Powers.

"In the course of paying a tribute recently to the successful flight of Mr. Henry Farman, the war correspondent of our contemporary the "Daily Telegraph," incidentally makes an interesting statement with regard to the nature of the negotiations between the Brothers Wright and our War Office. According to this authority, they offered to build a machine for £5,000 or £10,000 capable of flying 200 hundred miles at 40 or 60 miles an hour. The offer was conditional, however, upon a subsequent contract being entered into to the effect that a sum of about £100,000 should be paid to the Brothers Wright for teaching a British officer to fly the machine after they had satisfactorily demonstrated its powers. They declined to sell either the exclusive rights or to build flying machines at a price even with a guaranteed quantity order. Not unnaturally, our War Office were unable to entertain the suggestion, and as it seems that the Brothers Wright put similar proposals before other Governments, it is not altogether surprising that these pioneers should have been left somewhat out in the cold.

"If the Brothers Wright have done everything that they claim to have accomplished, they should know a good deal more about flight than any one living. Incidentally they should have gained a very fair idea as to whether anyone else—Mr. Henry Farman, for instance—is likely to very soon arrive at their own degree of perfection, in which case they must surely see the danger of being entirely supplanted if they delay in substantiating their claims any longer. If their 'secret' is so utterly unassailable—as their confidence in it seems to suggest—it is not altogether unreasonable to suppose that flying by their method may be altogether too difficult an art to be worth acquiring at any price, so that if some other intrepid experimenter can only solve the problem in a simpler way, so much the better for the general progress of aeronautics.

A CARICATURE OF FARMAN, BY MICH.

"It is, of course, only right that success should meet with proportionate material reward, but *on the whole we know of no more satisfactory or generous method of recompense than that which obtains from the institution of valuable prizes by wealthy patrons of the sport. There is a definiteness about such competitions which is encouraging to the pioneer.* He knows exactly what he has to do, and when he is successful he pockets a lump sum at once. Inventors, unfortunately, have a habit of looking upon their ideas as potential millions, and are often aggrieved when business men, who may possibly agree with them, demur at paying so much cash down for mere possibilities of the future. It should still not be too late for the Brothers Wright to make a substantial profit from their experience and to incidentally contribute in a somewhat more definite manner than they have done at present, their quota to the progress of science. If, on the other hand, they are determined to remain obdurate and not deal in a reasonable manner, we can only hope that the world will speedily show that it can get on very well without them."—*Automotor Journal, England.*

Lecture on Aeronautics at N. Y. Electrical Society.

At the 274th meeting on February 28th, Augustus Post, Vice President of the Society, assisted by Albert C. Triaca and Wilbur Kimball, gave an illustrated lecture on "Navigating the Air."

The lecture comprised a description of the latest developments in the field of aeronautics, and each stage of his address was graphically illustrated with lantern slides and with moving pictures of some of the most noteworthy gatherings and performances in recent days. A large number of the photographs and lantern slides were kindly loaned by the International School of Aeronautics established by Mr. Triaca. Perhaps the most interesting illustration was a motion picture of the Farman machine

in flight. Models, apparatus and instruments used in air navigation were exhibited, and the method of inflating a balloon was demonstrated with a complete model balloon from the Aeronautic School.

The lecture was divided into: I. Balloons, captive and free.—II. Airships, or balloons with motor.—III. Aeroplanes, or heavier than air flying machines. Kites.—IV. Helicopters, or direct-lift machines, without either gas bag or plane surfaces.—V. Ornithopters; bird-like, flapping, wing machines.—VI. Light Motors.

The lecture was most interestingly instructive. Other lectures on the same topic will be given before the Signal Corps on Governor's Island, Pratt Institute and the Explorers' Club.

Aero Club of France.

The Ae. C. F. will move into its new quarters, 63 Champs Elysee, in April. The next balloon contests will be held May 16 and June 11.

Engineer Colliex who drew the plans for the Farman aeroplane was given a souvenir consisting of a gold medal, designed by the sculptor Leon Delagrange. M. Colliex is chief of the technical staff of the Voisin Freres who built the machine.

The Aero Club of France has accepted for 1908, affiliation with the following societies: Académie Aéronautique (Paris), Aéro Club de Nice et de Provence (Nice), Aéro Club du Nord (Roubaix), Aéro Club du Rhône et du Sud-Est (Lyon), Aéro Club du Sud-Ouest (Bordeaux), Aéronautique Club (Paris), Club Aéronautique de l'Aube (Troyes), Société Francaise de Navigation Aérienne (Paris).

The Club, at the instigation of M. Archdeacon, has offered a prize of 500 francs for an instrument to indicate the position of a flying machine with respect to the horizontal during flights. The competition is open to Dec. 31, 1908.

Such an instrument must, of course, indicate changes quickly, be unaffected by external influences and capable of being easily and accurately read. A level of this nature was constructed in England. It consisted of a globule of mercury in a shallow dish, calibrated by concentric circles denoting degrees of tilt.

On February 6, Emile Dubonnet, Comte JeanRecope and Bob Valentin, travelled in the *Condor* from the park of the Aero Club of France to Arcachon, 323.11 miles, in 8 hours, a very good average of 40.4 miles per hour. Landing was necessary on account of the ocean.

New Books.

Airships Past and Present, by Captain A. Hildebrandt; translated by W. H. Story (D. Van Nostrand Co., 33 Murray St., New York; $3.50).

A résumé of aeronautic operations, embracing all branches of the science from mythological history up to the present day, has been dealt with in a masterly manner by Captain Hildebrandt, of the Prussian Balloon Corps, and the excellent translation into English is by Mr. W. H. Story. An interesting feature of the volume is the unique collection of photographs, which the author has compiled from various sources, and taken himself. Five chapters are devoted to the art of balloon photography, and expert advice as to the most suitable camera, lens, plates, etc., is given, together with the author's experiences. Chapter 14 is very interesting, as, under the heading of "Scientific Ballooning," it presents the reader with accounts of physical and mental effects produced upon the human being at great altitudes. Four chapters pertaining to military ballooning form, perhaps, the most important features of the volume, the episodes during the Franco-Prussian war being especially entertaining. Thrilling descriptions of hazardous descents in parachutes are treated upon, and the photographs illustrating these descents are of a distinctly exciting nature. The work accomplished in connection with aerial flight by such men as Santos-Dumont, Count Zeppelin, and Lebaudy, is also gone into fully by the author. Finally, although technically complete, a romantic vein runs through every chapter of this instructive book, which will appeal especially to the amateur reader.

NOTES.

The first week in February, there was held a conference at London between delegates from the Aero Club of France, the Aero Club of the United Kingdom and the Junior Institution of Civil Engineers. As delegates from France, M. Juilliot represented the aeronauts, Captain Ferber the aviators and Count de la Vaulx aeronautics in general. A dinner was given in their honor by the A. C. of the U. K.

Five hundred and fifty dirigible flights were made in America during 1907 at the various fairs and expositions. This is more than made by Patrie, Ville de Paris, Gross-Bazenoch, Nulli Secundus and the others combined.

Maurice Mallet, the balloon constructor, with Count de la Vaulx and others, has formed a "Societe Anonyme" to build dirigibles. The concern will not build new types, but only along the lines of the successful ones now in existence.

Major Moedebeck is getting up an aeronautic map of Germany, showing high tension electric wires, high church steeples, iron and steel foundries, points with favorable facilities for landing in balloons and airships, etc.

Bellamy in England tried his machine the first week in February. The machine ran along the ground for a short distance, but something gave way, and the trial was brought to a termination.

Voisin Brothers, the manufacturers of the Farman aeroplane, have received an order to construct a machine for the Chevalier Florio.

The Automobile Club of France has decided to take official cognizance of aero matters, and an aviation section is about to be inaugurated. The Automobile Club will work in harmony with the Aero Club, the latter to conduct trials and contests and the former to take up principally the improvement of light motors.

The Gross-Bazenoch military dirigible during the short time of its existence has made over 60 ascensions.

After the thirty-sixth ascension of the "Ville de Paris," the end of January, it was deflated, and the hydrogen gas utilized for free balloon ascents. An admirable technical description, with drawings, of the "Ville de Paris," is given in the February 1st Aerophile.

A society has been formed at Savigliano with a capital of $15,000 to build and experiment with a new aeroplane invented by a young engineer, Giovonni Fuseri, of Savigliano, Italy.

The Fabbrica Italiano Aerostati-Milano has been formed with a capital of $25,000 at 51 Via Gaetano Donizetti. Constructors of balloons, dirigibles and other aero material. Manufacturer of the dirigible "Frassinetti" with aerodrome and hangar for dirigibles.

Captain Ferber in an address before the Societe Francaise de Navigation Aerienne, said he had great confidence in the ultimate development of aviation. He said, among other things, "that he expected that the flying-machine of 1910 would travel 180 miles an hour."

A duplicate of the Farman machine may be had for $6000, and the machine which won the Deutsch-Archdeacon has been quoted at $8000.

On February 4, the German military dirigible made a sensational trip in a snowstorm and the officers in charge had to make a landing in open country. The balloon struck a thatch roof and carried it away. The country people succeeded finally in getting hold of it and rescued the aeronauts. The balloon did not suffer any damage.

A successful cross-channel trip was made on Feb. 8, by Capt. Grubb and Griffith Brewer, of the A. C. U. K., in the Melotis II from the Short balloon factory to Etaples, France.

A. V. Roe is working on his aeroplane at Brooklands Motordome and Griffith Brewer is expected out any day.

Mr. Carl E. Myers has taken exception to an item published last month relating to a new machine for the varnishing of balloon cloth and the making of nets. He states: "I have been producing such fabric exclusively for thirty years, at first pri-

vately, and later under basic patents to me, covering varnishing machinery, process and 'new article of manufacture.' ****The U. S. Net and Twine Company, of New York, has been producing square and diamond mesh nets by the mile with machinery for years and I produce a two-man airship net or spherical balloon net, fit complete, in thirty hours from start to finish by an easy system in use twenty years."

A discovery of rutile is reported by Consul F. W. Goding, from Queensland, Australia. Hitherto rutile has had no commercial value, but it is now used in the construction of aeroplanes. The advent of flying machines driven by gasoline motors that run at very high speed has proved that bearings and axles of ordinary metals submitted to speeds of 2,500 to 3,000 R. P. M. wear so rapidly and heat so quickly that the necessity has arisen for some metal to stand the strain and velocity without wearing or heating, and this has been found in the metal titanium, of which rutile is the purest ore.

Rutile is a titanium dioxide, containing from 70 to 98 per cent. of titanic acid, chiefly depending on the quantity of iron present. Pure rutile contains 98 per cent. of titanic acid and 2 per cent. of iron, when the mineral is a crystalline substance resembling sealing wax. The examples found in Queensland contain 70 per cent. and resemble wolfram, having a lustrous fracture and being uneven in the grain. The specific gravity of rutile is 4.2; it cannot be scratched with a knife, but can be marked with a quartz crystal. The mineral occurs with wolfram and tin, running in veins through quartz and quartzite from a mere streak to large bunches, and is worth four times the price of wolfram at the present time.—Scientific American.

Leon Bollee, the well-known automobile manufacturer, is reported to be engaged in the construction of a flying-machine at Le Mans. The Clement-Bayard Company are also said to have an order for one for a Russian sportsman.

The engineer, E. Delavey, director of the aeronautic establishment of Louis Godard, left Paris the last day of January to go to Rio Janeiro to install the military captive balloon outfit which left Paris in December. The apparatus consists of a gas generator, compressor, steel tubes, carriage for transportation, windlass, baggage wagon and various parts which go to make up a military plant and comprises the new hot-air balloons with an arrangement permitting ascensions of several hours with this type.

Making his usual forecast of the things near at hand in the scientific world, Nikola Tesla, thus pays his respects to aerialism: "The coming year will dispel an error which has greatly retarded the progress of aerial navigation. The aeronaut will soon satisfy himself that an aeroplane proportioned according to data obtained by Langley is altogether too heavy to soar, and that such a machine, while it will have some uses, can never fly as fast as a dirigible balloon. Once this is fully recognized the expert will concentrate his efforts on the latter type, and before many months are passed it will be a familiar object in the sky."—Motor Print.

Another garage is being built for the French Government dirigible "Democratie," at Epinal in the East of France. The airship will probably be ready in the Fall. The "Republique" will be ready for trial by May. It will be sent to Toul.

After visiting the autodrome of Brooklands, near London, in anticipation of securing a suitable place for attempts on the Daily Mail $5,000-mile-flight, Farman returned to Paris without accomplishing his purpose. No place seemed available that would be suitable.

Bleriot is building two new aeroplanes. The apparatus experimented with previously at Issy was 7 m. long. The length has been doubled for the two new machines. The forepart of the new ones is rectangular and the rear part triangular. A 16-cyl., 50-horsepower motor will be used.

During 1907, The Aero Club du Nord made 19 ascensions, of which 7 were ladies. Sixty passengers were carried. The number of members were doubled.

M. Balocco, of the Itala automobile works, is building a motor for the aeroplane of Henri Fournier, the famous automobile driver. It will be 8 cyl., V, air cooled, of a weight of 2 kg. per h.p. Fournier states "it will be real horsepower" and can be regulated as well as an automobile motor. A small model has already been constructed and Rheims & Auscher, the automobile body builders, will carry out the plans. It is of the monoplane type and will be ready in July.

It is predicted that ballooning will be the great sport of the future, and just as soon as the public mind can be disabused of the notion that the pastime is dangerous. Few persons ever get hurt in ballooning. They never know what happened to 'em.

At the balloon contests at Bordeaux, the week of February 16-23, nine balloons were started in the race for an objective point. There was no wind and all came down again on the outskirts of the town when it was seen to be impossible to accomplish the desired result. The "Malgre-Nous" of M. Wawack, through inattention during inflation, was bursted by the pressure of the gas going into the silk bag. The men were interested in seeing the first balloon off and did not watch the pressure valve. The rent was made through a section of the silk itself and not at a seam or at the ripping panel.

Captain Baldwin has sold the 1907 California Arrow to William Mattery. While being made ready for an ascent at Louisville someone decided to shoot up the show and the event was indefinitely postponed.

William E. McKenna writes a daily paper as follows:

Permit me to call attention to an infringement of vested rights which is becoming more and more frequent.

"Even the air is not free," says Sir Frederick Pollock in "The Land Laws," "for the maxim is that the owner of the sod is owner up to the height above and down to the depth beneath. I conceive it is indisputable that to pass over land in a balloon at whatever height without the owner's or occupant's license is technically a trespass."

Do the aeronauts realize this when they recklessly soar over other people's land or, coming down, get themselves tangled up in other people's trees? A technical trespass, perhaps; but great oaks from little acorns grow. Cannot some of your correspondents suggest a remedy? Would it not be well to make the aeronauts pay license of every large city as common carriers, their operators bidding for public patronage by low fares?

A. B. Lambert, member of the City Council of St. Louis and Hon. Secretary of the Aero Club of St. Louis, and one of the most enthusiastic and enterprising automobilists, is now on his way to Paris to take his final instruction in navigating a balloon.

Henry Kapferer is constructing at Montesson a Langley type machine and will experiment at Issy soon. The weight is said to be 400 kg.

According to the *London Daily Telegraph*, the English army aeroplane now building at Aldershot is progressing rapidly, and in the course of a few weeks may be expected to be taken out for a trial.

Mechanics are working overtime on the "Dirigible II."

Rene Gasnier, one of the champions of France in the 1907 Gordon Bennett, is constructing an aeroplane with a 50-h.p. Antoinette motor.

COMMUNICATIONS.

Does the United States Want an Airship?

To the Editor:

The question as to what our Government means by inviting bids for building and operating war airships and flying machines is a serious conundrum. It is reported from Washington, Feb. 8th, 1908, that the Government has accepted flying machine bids as follows: among 41 bidders:—J. F. Scott, Chicago, Ill., $1,000, time, 185 days, A. M. Herring, New York, $20,000, 180 days, Wright Brothers, Dayton, O., $25,000, 200 days.

This seems very much or very little for a full fledged flying machine, to carry two men and flit from 36 to 44 miles in one hour, or die in the act, and forfeit the amount of bid, as prescribed in the specifications. This looks like a hard proposition, but the specifications for dirigible balloons or airships are worse.

Bids for airships were invited in December and opened Jan. 15, 1908; the six bids being as follows:—Carl E. Myers, Frankfort, N. Y., $9,996, time, 120 days; Wm. Reiferscheid, Streator, Ill., $5,000, 150 days; Charles J. Strobel, Toledo, O., $8,000, 120 days; Harry B. Shiller, Philadelphia, $25,000, 120 days; John Karies, Mount Vernon, N. Y., $10,000 to $30,000, according to speed; E. W. Creacy, Washington, $12,500, 90 days.

All these bids were rejected. Only Carl Myers and C. J. Strobel qualified by accompanying bids by a certified check of 15 per cent. of the proposed price, and only Myers is a professional and commercial constructor of airships.

Revised proposals were invited Jan. 21st, for bids to be opened Feb. 15, under specifications which differed chiefly in requiring builders to supply their own gas-proof fabrics instead of using government supplies as at first proposed. On these ten bids were as follows:—Shiller, $33,000, 180 days; Rockman, $25,000, 180 days; Bumbaugh & Hei-

mann, $10,000, 250 days; Luppets, Paris, $20,000, 90 days; Carl E. Myers, $11,994, 120 days; Reiferscheid, $8,000, 150 days; Charles Ellis, $10,000, no time stated; T. S. Baldwin, $6,750, 150 days; Peter Cooper Hewitt, $20,000, 260 days; followed later by a bid from G. F. Myer of $6,000, in 100 days.

Here we have bids ranging from $6,000 to $33,000, all on a two-man airship to make from 16 to 24 miles per hour, to be built and delivered at Fort Myer, Va., in from 90 to 250 days, the successful bidder to inflate with hydrogen, operate 4 demonstrations, and instruct two officers, all at his own expense, under bond equal to the limit of his bid, for forfeit if inspecting officers reported unfavorably and subject to a reduced award of 15 per cent. of his bid for every mile less than 20 per hour, and bound to furnish a second vessel at award price if approved.

Taking for example the first bid of Carl Myers, amounting to practically $10,000, accompanied by a certified check, for $1,500., assumed to protect the Government, which supplied the gas-proof material for gas bag, of the maximum length specified, 120 feet. When his bid was repeated under revised demand for material to be furnished by bidder, samples of suitable machine-varnished silk of various grades were included, and his bid raised to practically $12,000, or $2,000 for the expensive silk involved necessitated by high import duties.

This estimate by a practical operator of 30 years' experience in the production of hydrogen-proof fabrics and their manufacturers into airships should be assumed to be a fair representation of value of finished fabric involved. Therefore, the first bid by Reiferscheid at $5,000, when the government supplied the material, compared with his second bid of $8,000, when forced to supply material, is an increase of $3,000, instead of $2,000 as estimated by Myers. The first bid of Schiller, $25,000, compared with his second bid of $33,000 shows the enormous increase of $8,000 for supply of material demanded, assuming that these cases include a mean speed of 20 miles per hour, and a maximum size of 120 feet length specified.

Analyzing another feature of the bids made, the lowest by G. F. Myer, $6,000, and Baldwin, $6,750, it must be remembered that these sums cover all expenses involved. Assuming that such bids be accepted, and the vessel built, conveyed to Fort Myer and tested, with a resultant speed of 16 miles per hour instead of 20, the award would be only 40 per cent. of the proposed 20-mile speed, $2,400 for Myer, or $2,700 for Baldwin, a "lemon" for either, as it would not pay expenses of delivering the goods, inflating and testing, besides instruction of officers, added to the incurred liability to deliver a duplicate vessel should the Government demand a second at the award price after testing.

With reference to speed, the best authenticated American airship time was at St. Louis contests, Oct., 1907. As stated in *"Aeronautics,"* Nov., 1907, "The course was laid from a line on the grounds out to and around the Blair Monument and return, three quarters of a mile," 3,960 feet. The same statement was made in the official program. On this scale the best speed was made by Beachey, 10 h.p. second trial, 4 minutes, 40 seconds, equal to 9 2-3 miles per hour; and by Dallas, 10 h.p., third trial, 6 min. 10 sec.; and Baldwin, 15 h.p., third trial, 7 min. 5 sec. *"Aeronautics,"* Jan., 1908, reviews these figures over an estimated course of 6,900 instead of 3,960 feet, with results of:—Beachey, 16.8 miles per hour; Dallas, 12.7 miles; Baldwin, 11.1 miles per hour, this with a one-man airship and 4 cylinder, 15 h.p. Curtiss motor.

The Government specification is for a two-man airship, having greater size and consequent aerial resistance than a one-man vessel. Engineering practice demands squaring the power to double the speed. Airships are built within narrow limits of their buoyancy or load. Applying these principles to the various bids referred to, it will be noted that a low bidder is handicapped by small dimensions, weights, values and expenditure till out-classed and out of the race, or possibly ruined by ruling. The difference between a slow and a speedy vessel is chiefly form, size with reference to carrying power or weight, air resistance or skin friction, and propulsion as adapted to power and shape. The larger and more expensive construction, if simple, has advantages, as its carrying power may increase as the cube of its dimension while its surface weight and resistance may increase only as the square, or in proportion of 8 to 4, enlarged.

Basing calculations upon the maximum dimensions and bid of Carl Myers, at $12,000, and a conservative estimate of 20 miles per hour, with total actual outlay of about $5,100, to produce the vessel complete, the excess above this sum provides for additional expenses of transportation, re-assembling, inflation with hydrogen, operating exhaustive tests, the instruction of officials, various contingencies, and the possibly reduced speed and award, 15 per cent. less for each mile below 20 per hour, or entire rejection if below 16 miles per hour, leaving the "successful" bidder with an "elephant" war airship on his hands, unfit for ordinary commercial exhibits, or sale, for which purpose $1,300 suffices to create a complete one-man airship outfit and gas generators, as I am now doing for cash.

In the matter of speed alone it is possible to sacrifice many other advantages, if unrestricted. The Government demands that counterpoising or balancing the airship

shall not be done by waste of gas or ballast, nor by shifting of the aeronaut's position along the boat or car, as is commonly practised. Also special means of compact transportation is favored, and the gas "must require no varnish," but must be of gas tight fabric. All these features are exactly in line with Carl Myers' productions during years past, and not practised by others. His vessel at $12,000 proposed also perfect control of equilibrium and movement, horizontal or vertical, at all times, and continuous adjustment of comparative gravity, in spite of expansion or shrinkage of gas by sun or shade, loss of gas or ballast, or lessened weight through consumption of gasoline or oil by the motor, all of which perturbing causes are met and adjusted by devices which he only is using today, and which add no weight to ordinary appliances of airships, though underlying all future progress of gas airships. The demand for speed is a justifiable one, but the demand for complete control is the only line which a government should especially welcome.

The results of the Government proposals are vague, and puzzling in the present state of the art, and certainly not inviting. While practical constructors and aeronauts are giving object lessons in public, our Government does not now possess even a one-man airship, or present skill to operate it in competition with professional aeronauts in this or other countries, but it seeks to remedy this defect this year.

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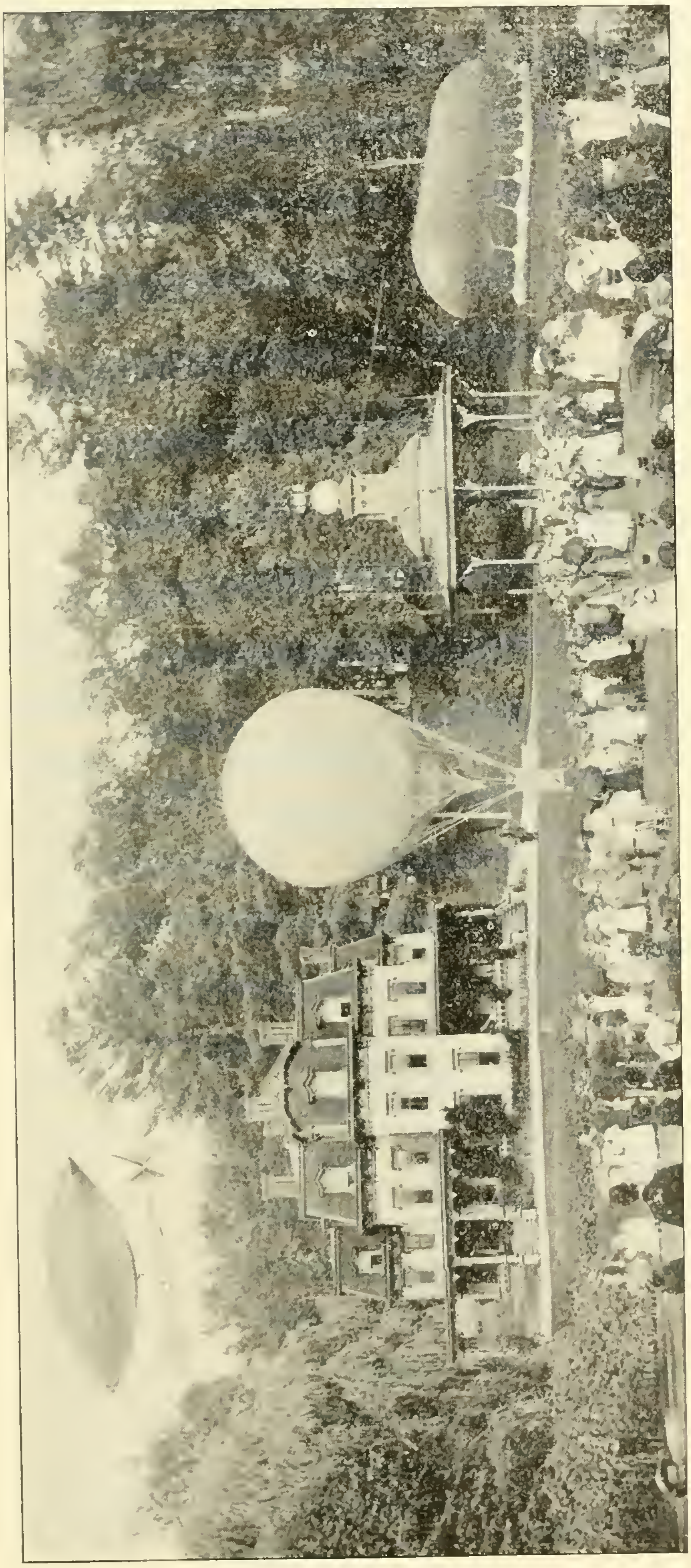

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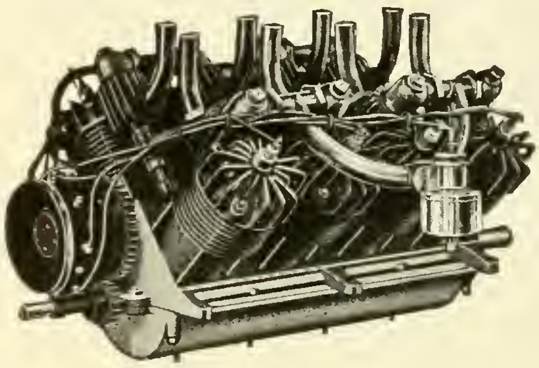

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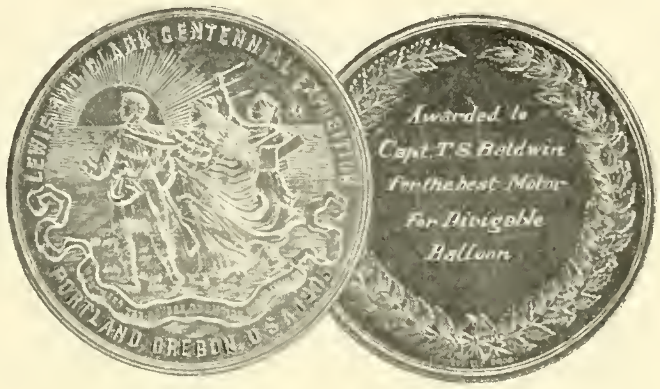

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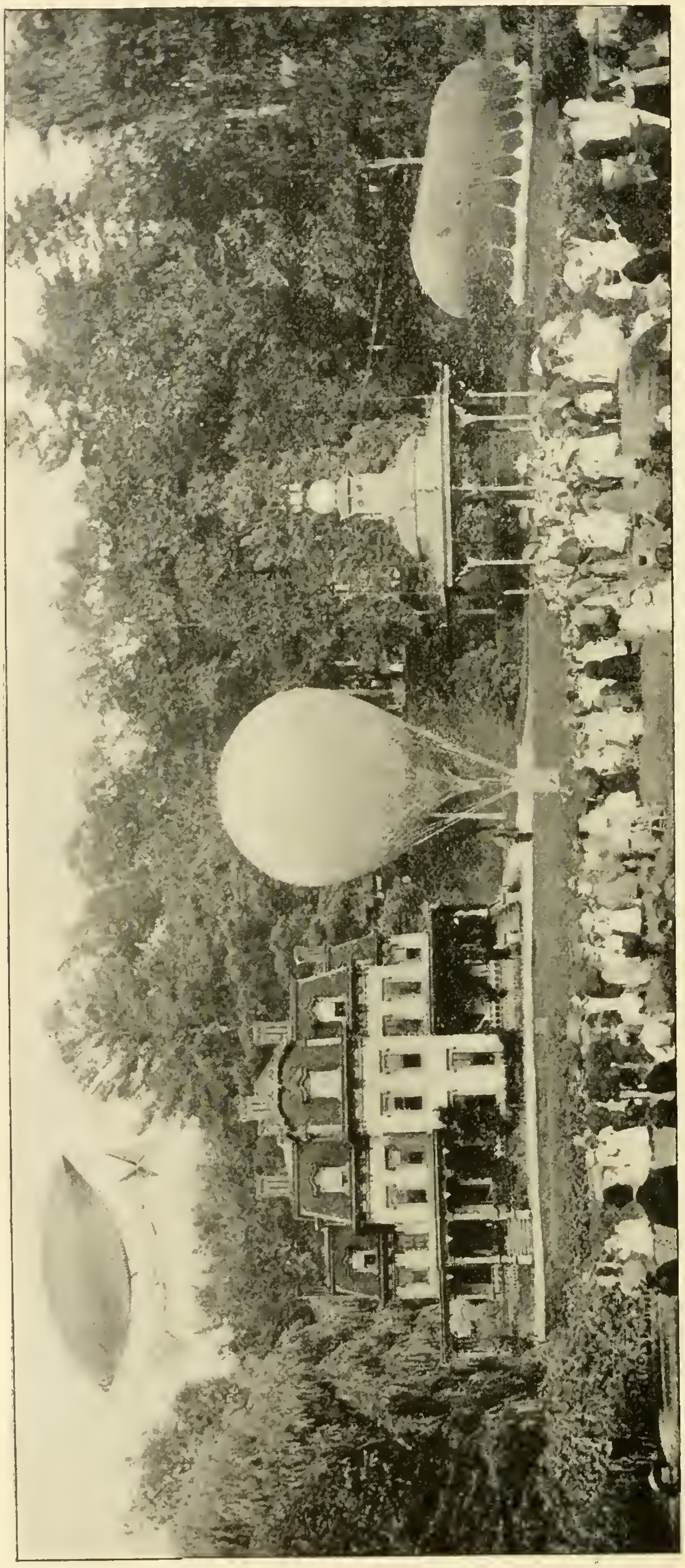

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AN AVIATION PRIZE IN AMERICA?

With the announcement abroad almost daily of a new prize for the encouragement of the study of aeronautical science it does seem as though some one in America should at least be "willing," if not anxious, to contribute a sum suitably large in comparison with those offered abroad.

Not a money prize in America for dynamic flight! We have an Aero Club whose members are worth $50,000,000—or more and an attempt to raise a thousandth part of that sum, $50,000, failed of accomplishment.

In this land of big projects, it would seem almost likely that a goodly prize would be offered merely for the honor of the country, not to mention an interest in the subject. But up to date there has been no apparent "run" on honor's bank.

We have either no wish to fly through the air, no money, or no desire to aid. The first is not the case; the second cannot be true, for we daily hear reports of the well filled pocketbook of the public; it must be, then, though most preposterous, that we do not want to aid. On reflection, however, this latter cannot be correct, for have we not an Aero Club "to advance the development of the science of aeronautics, * * * * * to encourage * * * * * aerial navigation" and to "do everything necessary, suitable and proper for the accomplishment of any of the purposes hereinbefore set forth?"

In what way can the science be furthered more than by offering prizes? Judging from the results accomplished by offering prizes in France, this seems to be the best way to "advance the development."

In France, at the end of his resources, Farman wins $10,000. Result—the first machine improved, the distance capable of being flown tripled, and a new machine under construction!

In America, no prizes and no flights.

If the offering of prizes is the quickest way to success, are not Aero Club members bound by their constitution to offer prizes?

NEW PRIZES—ABROAD.

Michelin.

Messrs. Michelin, the well known tire manufacturers, have offered $52,000. This amount is divided into two sections. It was first announced that a $2000 cup and a cash sum of $3000 would be given annually for ten years to the aviator who, between January 31 and December 31 in each year, would cover the greatest distance, either in France or in one of the countries whose aero club is affiliated with the Aero Club of France. The distance was to have been at least double that of the previous year. That is, the winner for 1908 must cover twice the distance made by Farman on January 13 last. The cup to be handed by one club to another as won, the cash going to the aviator.

This has now been changed. $4000 is offered annually for eight years, beginning in 1908. This sum will reward the aviator who makes the greatest distance during the year, the minimum to be 20 kilometers. Of course, the apparatus will not be allowed to touch the ground while flying and the aviator will have to be officially controlled. The prize is open for competition, beginning April 10. For 1909 to 1915 the official regulations may be modified yearly by the Aero Club of France to conform to the progress of aviation, without, however, making too difficult conditions. If during one year the prize is not won the sum will be added to the one of the following year.

There is also the grand prize of $20,000. If, before the first of January, 1918, an aviator piloting a machine carrying one passenger, establishes the following record in accordance with the A. C. F. rules he will win the sum of $20,000:

The flight must be from any place in the Departments of the Seine or Seine-et-Oise, a turn being made around the Arch de Triomphe, at Paris, another turn around the cathedral of Clermont-Ferrand and then a landing on top of the Puy-de-Dome, which has an altitude of 1456 meters (4777 feet), in the total time from the Arch of Triumph to Puy-de-Dome of 6 hours. The distance from Paris to Puy-de-Dome in a straight line is about 350 kilometers (217 miles). The speed would have to be, therefore, a little over 36 miles an hour.

M. Archdeacon calls attention to the possible difficulty on account of the drop in pressure from 760 to 620 mm. at the altitude to which Puy-de-Dome rises. Theoretically the motor would give slightly less efficiency.

Prince Roland Bonaparte.

The sum of $20,000 has been offered by Prince Roland Bonaparte as the nucleus of a fund for scholars and inventors, some of which money will be devoted to the progress of aviation and dirigible balloons.

Karl Lanz.

Karl Lanz, a merchant of Mannheim, has offered $10,000 to found an aviation prize. $2500 will also be devoted to the aid of indigent German inventors.

Aero Club of France.

A prize of $1000 is offered by the A. C. F. for a flight of 5 kilometers.

Other Prizes.

A prize (no sum yet mentioned) has been offered by Georges Dubois and Omet-Decugis and others, for a flight of 50 meters at a height of 25 meters.

On February 28 M. Charron paid Ernest Archdeacon $200 toward a prize for the encouragement of aviation. Following this came a contribution from Mme. Heriot, owner of the Louvre.

AVIATION PRIZES.

England.

*$50,000, London, Daily Mail, to the flying machine, preferably aeroplane, starting within five miles of Daily Mail Office, London, and landing within five miles of Daily Mail Office at Manchester. Distance, 160 miles.

$10,000, Adams Mfg. Co., if the motor and apparatus winning the Daily Mail prize be entirely constructed in Great Britain.

$2,500, Autocar, to the maker of the motor, if English, above competition.

*Also a gold medal offered by Santos-Dumont in connection with the above competition.

*$5,000, London Daily Graphic for a flight of one mile at Brooklands.

*$2,500, Lord Montagu, to the machine which makes the longest flight in any one year. Contest must be in England. $25.00 a mile in addition for every mile flown up to 25 miles.

*$12,500, Brooklands Racing Club, to the first machine which makes a flight of three miles above the (egg-shaped) Brooklands course, at a height of three to fifty feet. Speed must be at least ten miles per hour.

France.

*$2,500, Ruinart Pere et Fils, to the first aviator to fly from France to England or vice versa before 1910. This contest is international. The shortest distance is from Cape Gris Nez to Dover, 30 kilometers.

*$2,000, M. Armengaud, Jr., to the first aviator who remains in the air fifteen minutes.

*$1,000, Aero Club of France, for a flight of five kilometers.

*$200, M. Pepin, to the first aviator to fly across the Garonne.

*$4,000 in cash to be won by aeroplanes at Vichy in the Fall of 1908, conditions to be announced later.

*$52,000, MM. Michelin, consisting of $4,000 to be won each year for 8 years, the last holder to become owner; also $20,000 for a flight from Paris to Clermont, 217 miles, in 6 hours.

*$120 in three prizes of $40 each and three silver plaques offered by Aviation Commission of Aero Club of France for flights of 200 meters. One of these has just been won by Farman.

Various prizes for aeroplane contests at Bordeaux in July.

Belgium.

*$11,100 in cash in aeroplane races at Spa, in July, 1908. The largest prize is for a flight of 23 kilometers.

Germany.

*$2,500, Dr. Ganz, at Munich Exposition. Aviator must stay in air 10 minutes over a specified course.

$10,000, Karl Lanz, of Mannheim. Machines must be constructed in Germany of German material. Also $2,500 to aid poor German inventors.

United States.

*$100, A. C. Triaca, for the longest flight during 1908. Open to members of Aero Club of France and Aero Club of America.

Italy.

*$5,000 for an international aeroplane contest at Venice in October.

---

* The majority of these prizes are available to American competitors, or those of any other country, provided that in some cases the flights be made in the country in which the prizes are offered.

The only prize for dirigibles is that of M. Archdeacon. $4,000 cash and a $2,000 trophy, both annually during 1908-9, open from March 1 to October 31, for a flight of 200 kilometers, passing above St. Germain, Senlis, Meaux, Melun and St. Germain. This is international, open to any affiliated F. A. I. club. Landings for gasolene, etc., permitted.

THE ADVANTAGES OF THE HELICOPTER OVER THE AEROPLANE.

By Otto G. Luyties.

The helicopter type of flying machine has been comparatively neglected. Although suggested several centuries ago, supposedly by Leonardo da Vinci in 1500, much less work has been done on it than on other types of flying machines. Not even one man-carrying helicopter has ever been flown in free flight.

This neglect of the helicopter-type appears to have been due to a general impression that it does not offer a likelihood of success equal to that of the aeroplane or even of the ornithopter. It has, in fact, frequently been contended that even if one of large size could actually be constructed, and should be found convenient in operation, it would still be found very low in efficiency.

It will be the effort of the writer to briefly recount the occasionally admitted advantages of operation, and then to demonstrate that the mechanical efficiency of

a properly constructed rotatory machine is actually higher than that of the aeroplane. For convenience we may itemize the points to be discussed as follows:

Operation.	Efficiency.
1. Starting	7. Simplicity
2. Ascending	8. Safety
3. Balancing	9. Head Resistance
4. Hovering	10. Lift per square foot.
5. Descending	11. Lift per horsepower
6. Landing	12. Horizontal speed

1. The starting of a helicoper is comparatively simple, especially if it be of the vertically ascending type. It is merely a matter of starting up the propellers without requiring a special launching device or a long run on a smooth ground, as required by the aeroplane. This is important because such launching devices will not always be available and because large smooth open spaces are uncommon.

2. A helicopter can ascend nearly vertically. It can therefore arise from small starting places such as a small field surrounded by large trees. In actual use flying machines will encounter many obstacles such as high houses or steep hillsides. Such obstacles a helicopter will be able to surmount by simply rising at a steep angle whereas an aeroplane will be compelled to turn completely around and ascend in a large spiral. It is evident that the ability to fly at any angle with the horizontal will be of great advantage to the helicopter.

3. The balance of a helicopter may be made practically automatic. It is evident that the simplest way to secure equilibrium is by using a very low centre of gravity. The known objection to this construction is that it causes excessive pitching and rolling. Now in an aeroplane, violent pitching absolutely destroys its power to fly as it spoils the all-important angle of incidence of the supporting planes. But in a helicopter the essential angle of incidence is the angle of the blades with the shaft, which remains practically constant whether the machine as a whole pitches or not. Therefore a helicopter can be arranged to have a more pronounced pendular stability than is possible with an aeroplane. The helicopter, furthermore may readily be designed to have gyroscopic stability, without requiring as much special apparatus for this purpose as would be required by an aeroplane.

4. A practical helicopter will be able to hover over a selected point, whereas an aeroplane must continually move horizontally in order to retain its elevation. The ability to hover should prove a great advantage, for instance in taking observations and in selecting a suitable landing place.

5. A helicopter under good control could descend at any desired speed and at any angle, or vertically if preferred. It could, in an emergency, descend in a contracted space much too small for the flight of an aeroplane.

6. Landing will always be difficult. It is particularly dangerous in an aeroplane owing to the high horizontal velocity. At present aeroplanes can only land safely on smooth ground in large open spaces. It may be found possible in later models, to suddenly check the horizontal velocity at the exact moment of landing, but the general nature of the difficulty will still remain the same.

A practical helicopter would be able to descend slowly in any open space of moderate size and land safely whether the ground be smooth or not. If under perfect control it could land without any horizontal velocity either in a calm or in any moderate wind.

The above described favorable characteristics of a practical helicopter have been pointed out by other writers and are here repeated only for convenience. With one or two possible exceptions they have been described by Penaud, Chanute and Hastings.

The mechanical efficiency of the helicopter, however, has apparently not been so carefully studied nor so correctly judged, so that it merits further examination and discussion.

7. The helicopter can be constructed more simply than the aeroplane. In the former, the power is applied directly to the inclined surfaces, whereas in the latter the power is transmitted to a propelling device, and the resultant thrust applied to the planes. It will be clear, without elaborate explanation, that simplicity is especially desirable in flying machines, as weight and power are both limited, and as simplicity in these fragile structures favors reliability and safety. As this article is intended to deal only with general principles, details of structure will not be here discussed.

8. The achievement of reasonable safety is essential to practical flight. Special provision must be made against the occurrence of an unretarded fall and consequent complete destruction. Of course all heavier-than-air flying devices must fall in case of serious accident to their means of sustentation. In this contingency, however, they should not drop too rapidly nor upset in falling.

Now the supporting power and stability of an aeroplane are largely dependent

upon the continuance of its motive force. Stoppage of the motor means a sudden drop and a sudden backward shift of the centre of pressure. This is liable to cause a complete somersault particularly as the centre of gravity in an aeroplane is necessarily high and as curved surfaces such as are usually employed are in themselves unstable with the concave side downwards. An expert operator may occasionally, if the motor stops, be able to glide to the ground in an aeroplane as if with a gliding machine, but the actual landing is then likely to occur at a dangerous horizontal velocity.

Of course a helicopter will also drop if its motor stops but its stability need not be seriously affected. The drop may be made vertical if preferred, or given a slight horizontal component. The speed of falling will depend largely upon the weight per square foot, so that the advantage of large areas in this contingency is apparent. The low centre of gravity will tend to keep the machine right side up. In addition to this, the supporting surfaces may be arranged to have a slow reverse rotation about their shafts, thus forming an efficient and stable rotatory parachute. The rate of fall probably need not exceed 20 to 30 miles per hour with weights of one or two pounds per square foot, or about the landing speed of a man jumping from a height of 15 to 25 feet. An emergency descent at this rate would not generally seriously endanger the life of the operator.

9. The helicopter has a considerable advantage over the aeroplane in the matter of head resistance. Considering only the forward progress of the machine as a whole it will be clear without explanation that a helicopter flying with about three quarters of the horizontal velocity of an aeroplane will have approximately half its head resistance if the bulks are about equal. In order to analyze the matter, however, we may divide the total head resistance into two parts, namely the back pressure of the supporting surfaces, sometimes called the drift, and the head resistance of the car and body of the machine. The back pressure of the supporting planes may be divided into three parts, the head resistance of the front edges, the skin friction, and the horizontal component of the normal pressure.

Now as far as the head resistance of the car and body is concerned, the helicopter has the advantage of a slower horizontal speed. At the time of starting this advantage is most pronounced as the aeroplane has to overcome its full head resistance when first leaving the ground, whereas the car and body of the helicopter offer no horizontal head resistance at all during the difficult period of starting.

The head resistance of the supporting surfaces has heretofore generally been higher on models of helicopters than on aeroplanes. This is, however, entirely unnecessary as it is only a question of using proper areas, speeds, and angles to get the same ratio of lift to drift in a helicopter blade as in an aeroplane surface, provided that proper allowance be made for the helicopter blades working in disturbed air.

We may reasonably conclude that the head resistance of the supporting surfaces of a properly designed helicopter will be about the same as that of an aeroplane, and that the head resistance of the car and body will generally be less, principally owing to the slower horizontal velocity.

10. In the matter of lift per square foot the helicopter has this advantage over the aeroplane, that it may be designed with any desired lift per square foot within wide limits without materially affecting the horizontal velocity of the whole machine or the head resistance of the car and body.

It has been urged in favor of the helicopter that this fact will permit of the use of very small areas thereby reducing the weight of the supporting surfaces. The writer does not recommend this construction, particularly not for use during the present early stage of the art, as it is dangerous in case of a sudden fall, and as it requires very light construction and inordinately powerful motors. It should also be observed that the use of high speed and very small areas reduces the lift per horsepower and consequently the efficiency of the helicopter as a lifting device.

Nevertheless, the fact that the lift is practically independent of the horizontal velocity of the machine as a whole is a great advantage of the helicopter over the aeroplane and itself accounts for the majority of the advantages in operation referred to earlier in this article.

11. In the matter of lift per horsepower the helicopter has heretofore been stated to compare unfavorably with the aeroplane. A number of authorities including Chanute * give the lift per horsepower of a helicopter as about half that of an aeroplane. As this question is of considerable importance and as the author believes his deductions to be original the matter will be discussed in some detail.

It will probably be granted that the blades of a helicopter may be considered as aeroplane surfaces of the same area and inclination moving with the same linear velocity, provided that proper allowance be made for the effects of rotation, particularly centrifugal force and operation in disturbed air. The writer contends that the

*"Progress in Flying Machines."

helicopter provides a simple and efficient method of direct drive for the supporting surfaces. The lifting force of a helicopter will be the full thrust of the shaft or in other words, the full lift of the supporting surfaces directly driven by the motor.

Now in an aeroplane, the supporting surfaces are indirectly driven by the motor through the horizontal thrust exerted by the propeller. This has been described as a means of actual increasing the efficiency as the total lift of an aeroplane is equal to the thrust of the propeller multiplied by the ratio of lift to drift of the supporting surfaces. Thus it has been found, for instance, that a propeller giving a thrust of eight pounds per horsepower when driving an aeroplane with a ratio of lift to drift of 5 to 1 would support a total weight of 40 pounds per horsepower. This has been described as a method of increasing the lift per horsepower because the same propeller used directly as a helicopter would evidently support only eight pounds per horsepower

The error lies in the assumption that this same propeller would actually be used in this way, whereas propellers intended for use as helicopters can actually be constructed to give a thrust of over 50 pounds per horsepower. The reader may wonder why, if this be correct, propellers giving such a large thrust are not used on aeroplanes thus obtaining a still larger lift and preserving the supposed advantage of the aeroplane.

It should be remembered that the screw propeller is simply a mechanical device for exerting thrust or pressure. As soon as this pressure is exerted over a given distance the work done can be expressed in foot pounds or horsepower. For any given efficiency, therefore, the thrust that can be obtained per horsepower will vary inversely as the distance through which it is exerted. A propeller of perfect efficiency for instance could give a thrust of 8 pounds per horsepower at a velocity of 69 feet a second or about 46 miles an hour. Another propeller also of perfect efficiency might give a thrust of 50 pounds through a distance of 11 feet per second or about 7½ miles per hour. These are the theoretical maxima for the given speeds, the distances per second through which these thrusts could actually be exerted being much less, owing to the yielding of the air, skin friction, etc. Now it is well known that the yielding of the air is relatively larger for propellers progressing slowly along their axes, but even so, the largest thrusts can be exerted at the slowest speeds if the propellers are properly designed for their work.

If the slip in the cases suggested above be assumed as 8 miles per hour in one instance, and 5 miles in the other, being about 17 per cent. in one case and 67 per cent. in the other, the first propeller will give a thrust per horsepower of 8 pounds at 38 miles an hour, the second a thrust per horsepower of 50 pounds at 2½ miles. These figures are fair examples that might occur in actual construction.

As aeroplanes require a considerable horizontal velocity in order to fly at all, it is evident that they will always be limited to the use of propellers giving only moderate thrusts per horsepower. It is the contention of the author that this more than balances the advantage of the favorable ratio of lift to drift of the supporting surfaces. The aeroplane, considered as a supporting device, also has in its propelling mechanism a source of inefficiency not occuring in the helicopter.

The helicopter is handicapped by having its blades work in disturbed air. This disadvantage is a serious one but is not quite as great as generally supposed, because the drift is reduced at the same time as the lift and nearly in the same proportion. As soon as the helicopter moves horizontally its blades act on fresh air and the lift is slightly increased.

The helicopter is sometimes stated to lose in efficiency owing to the action of centrifugal force. It is assumed that air is thrown outwards requiring power without giving an adequate supporting reaction. Now as a matter of fact the centrifugal action must be very small if it occurs at all, because it is shown by experiment that there is an actual inrush of air around the circumference of a helicopter and even for a short distance below its blades. In any case, as centrifugal force depends largely upon the angular velocity it may be reduced by using large diameters and low speeds and by adopting an efficient form of blade.

Considering both types of machines in a general way the incidental head resistance will also reduce the lifting efficiency, but as the helicopter at its usual slower speeds will have a smaller head resistance of car and body than the aeroplane, it will lose power from this source. The writer is inclined to believe that the advantage of reduced head resistance will balance the disadvantage of working in disturbed air, but this can be definitely determined only by actual experiment on a large scale.

As far as theory is concerned the author holds that the direct drive of the helicopter is more effective than the indirect drive of the aeroplane, and that with suitable construction the helicopter will actually give a larger lift per horsepower.

12. The writer contends that the helicopter will have a higher horizontal speed and greater translational efficiency than heretofore supposed. It is apparently generally believed that the velocity of the forward motion will depend simply upon the

cosine of the angle of inclination of the main shaft with the horizontal. This would make the maximum attainable horizontal speed equal to the maximum theoretical pitch velocity times the cosine of the angle. The actual horizontal speed would naturally be estimated at less than this owing to the head resistance of the car and body.

But the author contends that the horizontal speed will exceed this supposed theoretical maximum and may even exceed the full theoretical pitch velocity. This is a striking paradox, but if correct is important and therefore worthy of careful analysis.

Let us consider the thrust along the inclined shaft to be divided into two components, the one vertical, the other horizontal. Let us assume the vertical component to be balanced by the weight. Let us further assume the effective pitch angle of the blades to be for example 12 degrees and the angle of the main shaft with the horizontal 78 degrees. The currently accepted computation would then give a maximum horizontal speed of about one-fifth of the pitch velocity.

Let us now analyze the action of the blades. In the assumed case they will make no angle with the horizontal on the forward stroke and double the pitch angle with the horizontal on the back stroke. Then the forward stroke will have a lifting effect but practically no horizontal component. This is because the pressure on an inclined plane is always perpendicular to the surface.* Of course there may be a slight backward horizontal pressure due to skin friction, or a slight forward horizontal component, if the surface be slightly curved, due to the tangential force described by Lilienthal,** but for practical purposes the pressure on the forward stroke may be considered vertical.

The back stroke will give a strong forward thrust on account of the pronounced angle of the blades with the horizontal. This will continue as long as the blades move backwards faster than the whole machine moves forwards. This forward thrust, at least during the central part of the back stroke, will not disappear entirely until the horizontal velocity of the whole machine equals the linear rotational velocity of the blades. But the linear velocity exceeds the pitch velocity if the pitch be less than unity.

Therefore the attainable horizontal velocity exceeds the pitch velocity times the cosine of the angle and may even exceed the full theoretical pitch velocity. It is thus a fact that a slightly inclined helicopter may travel horizontally faster than it would if used directly as a horizontal propeller.

It immediately follows from the above that the horsepower required for horizontal motion will not be as high as might otherwise be the case, the power for vertical support being separately considered. The efficiency of a helicopter as a vehicle for horizontal transit will also be fairly good if driven by a special horizontal propeller intended to increase the horizontal velocity, provided that the main shaft be inclined forward at a suitable angle in order to take advantage of the above described peculiar feathering action of the main blades.

It thus appears that the maximum horizontal velocity and transit efficiency of the helicopter although lower than those of the aeroplane will be sufficiently high for practical use and very much higher than heretofore supposed. It will always be an advantage that the horizontal velocity can be regulated, and especially that it can be reduced to practically nothing whenever desired.

Summary

In summarizing our conclusions we may say that the helicopter can be made superior to the aeroplane in the first nine points considered, namely: starting, ascending, balancing, hovering, descending, landing, simplicity, safety and head-resistance. The author also contends that the helicopter may be designed to have a very large lift per square foot, or a very large lift per horsepower, and that its horizontal velocity, although less than that of the aeroplane, will be considerable, variable and sufficient.

As this article is limited to a theoretical discussion the desirability of testing the conclusion in practice is evident. The author is engaged in experiments along this line and expects soon to publish the results of some tests of a large helicopter. The important questions of lift per horsepower and of horizontal velocity appear to be especially worthy of discussion and experiment. The author hopes that this article may serve to arouse greater interest in the comparatively neglected helicopter-type of flying machine and that the merits here asserted and discussed may be fully confirmed in actual practice.

Baltimore, Md., March, 1908.

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*See "Aeronautics," Vol. I, No. 3; Page 11, Sept., 1907.

**See Moedebeck's Handbook, English Edition, p. 289.

WHAT THE AERONAUT CAN DO FOR METEOROLOGY.

By Professor Cleveland Abbe, Editor U. S. Monthly Weather Review.

In an aerial voyage the aeronaut and his assistants usually have certain special objects in view that demand their full attention—but still, it is easily possible for an earnest man to make every voyage tell along the special lines in which students of the atmosphere are interested. No generous minded navigator of the ocean omits to keep a full record of wind and weather, barometer and thermometer, ocean currents and temperatures, and whatever can be considered as appertaining to navigation. He does this partly for his own information, partly as the habit of a cautious man—principally because he knows that the pilot chart of the ocean that he uses daily is compiled from thousands of such records gratuitously contributed for many years to the central national hydrographic offices at London, Paris, Hamburg and Washington where the charts are published.

Those who contribute this observational data receive the "pilot charts" in return, or a thousandfold more than they give.

Precisely analogous arrangements should be made by the aeronauts with their central meteorological offices. They can hardly expect the meteorologist to tell them beforehand what upper winds and temperatures to expect on a given day unless they furnish from past voyages the material that is needed for such predictions. The students of the atmosphere who are employed in Government weather bureaus get daily reports as to conditions at the earth's surface and as to the clouds, if any are visible, and they have these many years asked for regular reports from balloons and kites as to upper air conditions—but asked in vain, because this branch of meteorological work has been expensive and has only lately been developed. An aeronaut is but helping himself when he sends us copies of his records, since he is sure to receive in return items of valuable knowledge generalized from numerous other corresponding reports.

For instance, in December, 1871, the veteran aeronaut, Prof. Samuel A. King, who is still living and active in Philadelphia, communicated to me the records that he had saved up relative to his early voyages. From these I compiled a table and deduced a law that was at once published by the Philosophical Society of Washington, showing that in general, with scarcely a single exception, the higher he ascended so much the more did the direction of the movement of the balloon and the air deviate from that near the ground, the deviation being always toward the right, and frequently amounting to a semi-circle by the time that he reached the highest current flowing eastward. Of course, such a law as this when once well established would become most important for all long voyages in North America and equally important when one has to calculate for his descent and choose a landing spot on the shore of lake or ocean. I was at that time wholly absorbed in the study of the daily weather maps and the practical forecasting of the winds and weather (telegrams and forecasts were made daily at 10 a. m., 5 p. m. and midnight). The same law had just been revealed by the comparison of these telegraphic reports of the motions of the winds, lower clouds and upper clouds, but the continuous records of balloon voyages, when the sky was cloudless, now extended this local rule into a generalization of the broadest character. Subsequently I found that Clement Ley, from cloud observations in England, had arrived at the same result and eventually I found that Henry Allan Broun had announced it at Edinburgh in 1845.

The international cloud work of 1896-'97 has served to reveal the universality of the law that the upper winds deviate from the lower winds toward the right in the northern but toward the left in the southern hemisphere.

It will be a fine contribution to our knowledge if some aeronaut following Professor King's habit of keeping careful records of his voyages shall show us when and why exceptions to this rule occur—as they probably do occasionally.

The records of the recent long distance competition of 1907 in which the balloon "Pommern" exceeded by a few miles the long voyage of 791 miles by John Wise on 1st and 2nd, 1859, show that some of the aeronauts took advantage of this law.

In order to get a good record of the varying directions of travel the aeronaut has only to keep his map at hand and mark thereon by numbers within circles (1), (2), etc., the position immediately below him as often as he can possibly identify it. But he doubles the value of his record if he also adds the minute and second (or minute and tenth of a minute if his watch has no second hand), for thus he gives the meteorologist the one datum that we can only get from free balloons, namely, the true velocity of the movement of the free air.

The heat that we get from the sun starts the atmosphere in motion. From these movements when actually known we may reason back to the heat that caused them or forward to the results that must follow. The movement of each part of the atmosphere is the fundamental need of meteorology. The chart and watch, the barograph and thermograph of the aeronaut can alone give us what we so sorely need.

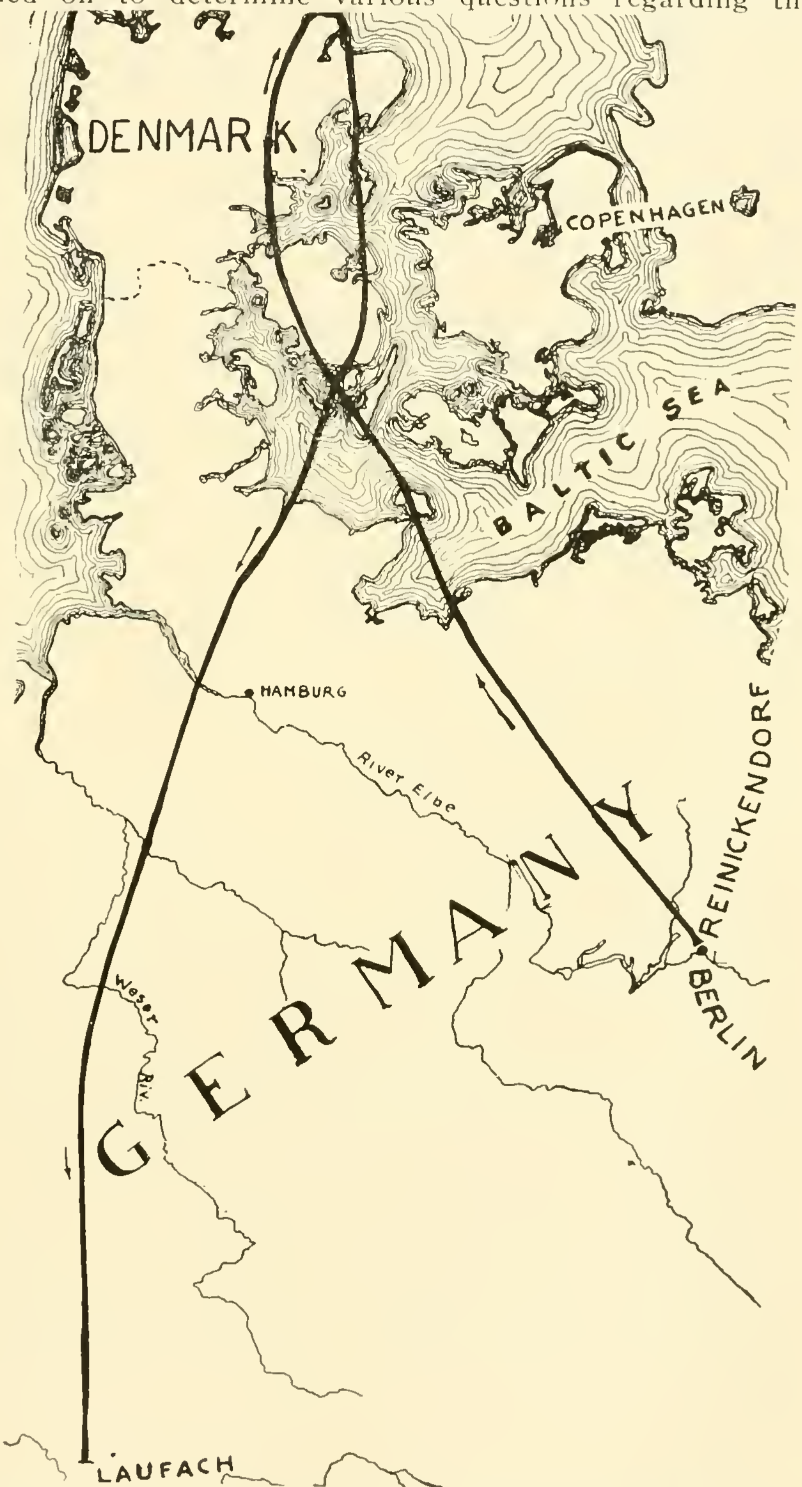
Every wise aeronaut, every amateur balloonist, will contribute his little to the common fund of knowledge.

The Weather Bureau is now preparing ascension record blanks which will call for data of value to the Bureau. These will be distributed gratis to balloonists. The forms will be reproduced, with the instructions, in the May number of Aeronautics.

OUR 52-HOUR BALLOON TRIP.

By Dr. Kurt Wegener.

On the first Thursday of each month at a number of institutions of learning, aeronautical experiments are carried on to determine various questions regarding the atmospheric conditions, to a certain extent; they include free ballooning, captive ballooning, and balloon ascensions with registering instruments, etc.



As before, the free balloon continues to be the one to help these experiments more than any other, gives results that can be depended upon, and is independent of the weather which gives the scientists so many opportunities to carry on important experiments.

The following described trip, which was made from the Observatory at Lindenberg, should have begun without fail on the evening of Wednesday, April 4th, 1906, so as to enable the companion, my brother, Dr. Alfred Wegener, who had made many observations by day, to likewise make observations by night. We desired on the following day to ascertain the meteorological conditions at a high altitude.

At the inflation, which, as usual, was made by the balloon battalion at Reinickendorf, the net of our balloon "Brandenburg" became damaged, and we were able to only make our ascension at 9 o'clock in the morning of April 5th in another balloon hurriedly made ready.

Because of this our plans had to be changed; our efforts now had to be bent to make an easy trip the first day in order to be sure to be in position to make the necessary observations during the following night, and then the following day be able to take the balloon to a higher altitude.

As the balloon started to rise in a thick fog, although above the sky was quite clear, it acted very restless, and directly after we had begun to ascend it settled again on the ground and again rose and settled before we could do anything to remedy the evil.

The mid-day heat made a considerable change in the atmosphere, and we noticed that the partly warmed air rose while the colder air sank away from it. This vertical downward current is the principal enemy of long balloon trips, for it always means a sacrifice of ballast when a balloon is suddenly caught by one of these downward currents.

The balloon flew rapidly over the Tegeler Sea, Neu-Ruppin and Wittstock, and toward noon sailed east from Wismar toward the ocean (Baltic Sea). Soon the ocean became visible in all its greatness below us, and the smoke we could see in the distance showed that we had the same wind as we had before. Cities, forests and water flew past under us.

It was by much hard work that we succeeded in putting the basket in order, and in doing this work we discovered many defects in our equipment which we did not notice in our hurried departure. For provisions we had only for each man one pound of chocolate, two cutlets, one orange and one flask of seltzer. We also discovered we had forgotten something even of more importance. In our hurry to get away we had forgotten to take our heavier coats, and we only wore light Summer jackets.

Soon Fehmarn lay under us; we just cut across its west corner, and we flew further toward Langeland and Funen (a peninsula of Denmark). At this time the sun began to sink. The lessening of the sun's rays cooled the balloon, the gas contracted, and we began to sink. After the sun began to sink we had to sacrifice four bags of ballast.

When over the north coast of Funen it became dark; and when shortly afterward we approached the east coast of Jutland (Denmark) by Fridericia, the earth could only be seen by dim moonlight.

We had lived fairly well the first day; almost three-quarters of a pound of chocolate and one cutlet were used. In spite of this, as a result of our heavy work with the ballast bags and because of the extreme smallness of our basket (1 m. x 1.20), we had many pains, which were very noticeable at each movement of the basket.

During the night we had another queer experience. The aeronaut knows that the basket begins to shake slightly when the drag rope drags on the earth. We had decided to remain at 2-300 m. altitude because the current below us travelled too much toward the west, directly toward the North Sea.

The basket began to shake slightly while I lay rolled up in the bottom of the basket vainly trying to sleep. I imagined that my brother, who had assumed command of the balloon, had fallen asleep, and that the balloon had sunk so that it was resting on the guide rope. I called to him: "The guide rope is dragging." But he answered, "No, I am only shivering from the cold." It was he, shaking from the frost, which did not leave him until after we had landed.

The course changed slowly to the north while our speed slackened. We were a little puzzled as to our whereabouts, but determined our position after investigating our charts.

Slowly the balloon, continually turning toward the right, approached a long Fjord (we believed this at first to be the Limfjord, but later it proved to be the Mariager Fjord). We then changed our course entirely to the east and approached the Kattegat. Soon the rising sun began to warm us and the balloon continually rose until twelve o'clock noon without using any ballast. When at an altitude of 2500 m. we saw the country we had passed over without knowing our whereabouts stretched out below us like a chart. During the time the balloon was rising we stood practically still. Only after noon time, when the balloon again began to fall, we found more wind, and drove with increasing speed toward the south, over Funen and Aero, where we crossed our path of the day before toward Kiel, which we passed over at six o'clock in the evening.

Our rations on the second day were cut down some. Six chocolate bonbons, one cutlet and a half orange per person.

The sun when it set on this day also cost us four bags of ballast, so we had left only 12 bags out of 38 we started with.

The first part of the night we passed very restless. After passing Kiel our course began to turn sharply toward the right, so that we feared we would be driven over the North Sea, and we prepared to land. While we were considering the question of landing, our balloon rose to an altitude of 2400 m., where we suffered considerably from the cold and exposure. It must have been 10 deg. C. up there, and we could hardly endure it.

Soon, however, the course again changed toward the south, and we again got control of our balloon. During the night the balloon drifted over the Elbe and Hamburg; and over the Luneburger Heide.

Owing to the incompleteness of our charts, we again here lost our position, and were unable to again tell our whereabouts. We were, however, able to determine our course by the aid of astronomy. In the morning the sun again pulled us into a higher

altitude, and we gained an altitude of 3700 m. and continued to fly over cities and towns. The cold at this altitude—16 deg. C.—combined with our cramped quarters and insufficient nourishment, made it unbearable. After we had been at this altitude about two hours, at 11:30 o'clock we again began to descend, although we still had six bags of ballast.

When we came nearer to the earth we drifted under a heavy cloud and into a strong downward current, and we had to use four bags of ballast in two hours, and were compelled to land near Laufach in Spessart after a trip of 52½ hours' duration. We had in fact broken the record for duration.

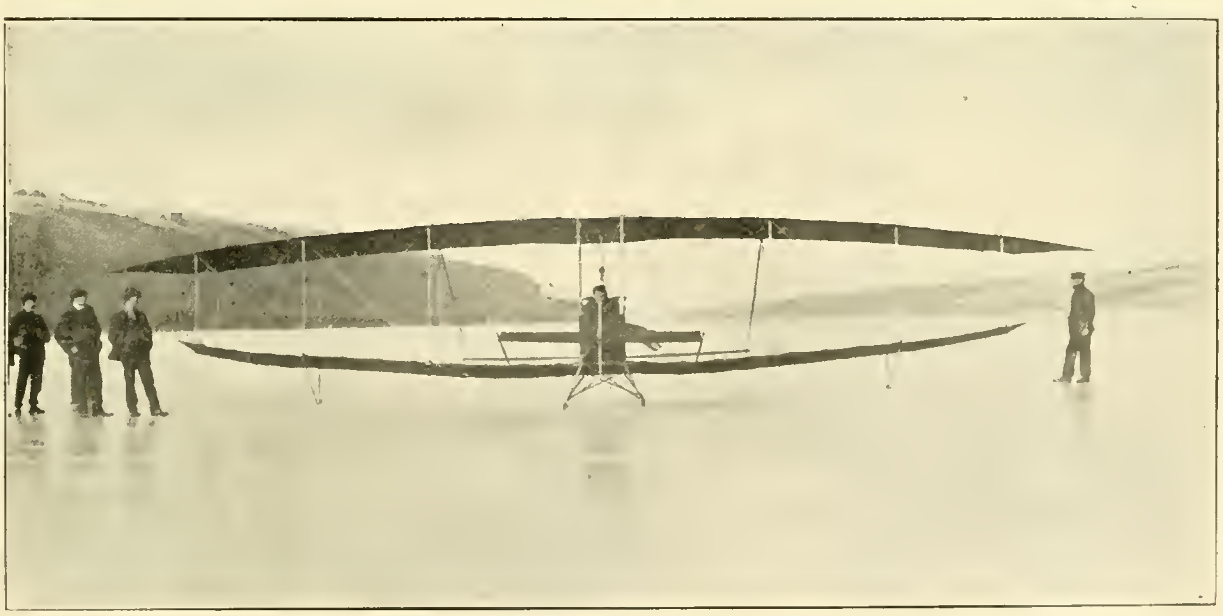
We gained many important points for science on this trip. De La Vaulx in his record trip of 35 hours to Kiew, in southern Russia, was exhausted when he landed. He had a balloon of 2000 m. capacity, well equipped, and with plenty of clothing, etc. We, however, had a balloon of only 1200 cu. m. capacity, with a miserable equipment and insufficient food and clothing. We account for this now that De La Vaulx remained at too high altitudes. During his second night he was at an altitude of 5000 m. According to our records on the third day we did not once reach an altitude of 3700 m. The lesson learned by our long trip was: "Keep your balloon as near the earth as possible all the time." We probably had an advantage over many others, as I did not spend 2½ years at the Royal Aeronautical Observatory for nothing, testing the atmospheric conditions day after day. During our trip, understanding these conditions as well as we did, we did not once think about any danger.

THE FIRST SUCCESSFUL TRIAL OF THE NEW AEROPLANE "RED WING" OF THE AERIAL EXPERIMENT ASSOCIATION, AT HAMMONDSPORT, N. Y.

By First Lieut. T. Selfridge, First Field Artillery, Secretary.

The motor driven aeroplane "Red Wing" was completed and ready for trial March 9, 1908, in slightly less than seven weeks after she was started. This was the virgin attempt of the Aerial Experiment Association to construct a motor driven aeroplane of this type, and hence we were not over-sanguine of success at the first trials.

Completed, the dimensions of the apparatus are as follows: two superposed aero-curves of a mean depth of 5′ 3″ (6.3′ front to rear at the center and 4′ at the extremities) and the same mean distance apart. The front edge of the upper plane extends out 4′ beyond the last vertical connecting posts at each end and the silk surface tapers back from this point to the last verticals at each end of the rear edge.



THE RED WING AEROPLANE.

The total spread of the upper plane is 43 feet. The total spread of lower plane is 36′ 8″. The total area of surfaces of the cell is 385.7 sq. ft.

The vertical struts are spindle-shaped, the greatest width of the cross-section being from a fourth to a third of the distance back from the front edge. The horizontal members are likewise spindle-shaped. The large center struts are 4″ from front to rear and 1″ greatest width. The next struts on either side are successively smaller

down to those at the end, which are 1.5″ front to rear, with a thickness of .5″. The surfaces are of silk with transverse pockets in which are inclosed the bent laminated wood strips extending from the front to the rear edges of the surfaces to give the surfaces their curved form. Above each strut a T-shaped wood strip extends from front to rear and helps to strengthen the structure. The spacing of the vertical struts decreases from the center toward the lateral extremities. The two center struts at the front and rear edges are about 22″ apart; the first strut on either side of these two is 6.5′ distant, the next 5.5′ and then 5′ to the outer struts. The framework is still further strengthened by steel cable guys 1-32″ diameter.

The tail consists of a single surface 14′ 10″ by 3′, whose front edge is 10′ in the rear of the rear edge of the main surfaces.

In the center of the tail, and above, is placed a balanced vertical rudder 4′ by 4′. The tail is set at a fixed angle of 7.5 degrees with the front surfaces. A horizontal rudder 8′ by 2′ is supported at the end of a pointed bow of rectangular cross-section (22″ by 22″), which projects from the front of the middle panel. The rear edge of the rudder is 5′ in front of the front edge of the main planes, making the maximum longitudinal dimensions of the machine 26′ 3″.

The engine is an 8-cylinder air-cooled Curtiss, a carburetor to each cylinder, developing 40 horse-power at 1800 r.p.m. It has 3¼″ bore and 3⅝″ stroke and weighs

THE RED WING AEROPLANE.

145 pounds. The ignition is by jump spark from a single coil and distributor. The intake valves are automatic. The crank shaft is of Vanadium steel 1⅛″ in diameter, made hollow. The cylinders, pistons and rings are cast from a specially treated pattern and are ground carefully to fit. The crank case is cast from the new light aluminum alloy "McAdamite." The total weight of the engine, batteries and coil, gas and oil tank, fuel and propeller, is 200 pounds. The engine is mounted between the main surfaces and drives direct a 6′ 2″ propeller of two blades having approximately a 4′ pitch. The operator sits inside the bow, which is covered with silk, about 6″ in front of the front edge of the planes.

The total weight of the apparatus, without engine or operator, is 185 pounds. The operator weighs 185 pounds. The total weight complete with motor and operator is 570 pounds, to an effective area of 385.7 square feet.

On March 9 the machine, which was fitted with runners for the purpose, was put on the ice with a view to ascertaining the effect of the vertical rudder. The area of ice available was so restricted that it was out of the question to attempt a flight, and no runs of over 100 feet or so were made with the engine running. These trials were quite satisfactory and no alterations were made.

Owing to adverse weather conditions it was impossible to get the machine out on the large expanse of ice on the lower part of Keuka Lake, about five miles from the aerodrome shed, until the morning of the 12th. A steam barge was used to convey the apparatus to the starting point. The ice was found to be rather soft but in sufficiently good condition to warrant a trial. After assembling the machine, F. W. Bald-

win, M. E., of Toronto, Can., mounted it and G. H. Curtiss, of Hammondsport, N. Y., its maker, started the engine.

It was hardly expected that the machine would rise at the first attempt. The motor was running with the spark retarded and no effort was made to have it develop its full power. The apparatus gathered momentum very quickly, and, much to the surprise of everyone, left the ice after travelling only 200 feet from the start. She arose to a height varying between 10' and 20', and had flown but a short distance when the right half of the tail buckled up, causing the right wing of the machine to lower and the apparatus to turn to the right, at the same time descending. The right auxiliary runner struck first, breaking the strut above it, while the machine pivoted about this runner and settled on the ice facing the starting point. The switch was then thrown out and the "Red Wing" came to a stop not far from where she left the ice, her momentum carrying her some distance after the power had been shut off.

Measured in a direct line from the point where the runners left the ice to the point where they first touched on descending, the distance was exactly 318' 11". The actual distance travelled was somewhat greater than this, as the machine described a curve while in the air. Twenty-five onlookers witnessed the flight.

As it was impossible to make the necessary repairs on the spot, the machine was brought back to her shed, thus terminating the trials for the day. The experiments will be resumed at the earliest opportunity, and upon the disappearance of the ice, the apparatus will be placed on wheels.

The actual thrust of the propeller was probably in the neighborhood of 130 pounds, but this was not definitely known, as it had not been measured, and the engine at the time of the flight was certainly not developing over 20 horse-power.

MARCH AEROPLANE FLIGHTS AT ISSY.

The first two weeks were miserable, wet and cold. The field at Issy was a veritable lake. Work has been pushed on the machines in the shops of Chauviere and Voisin, and several new ones will be out soon. Kapferer and others are merely waiting for good weather.

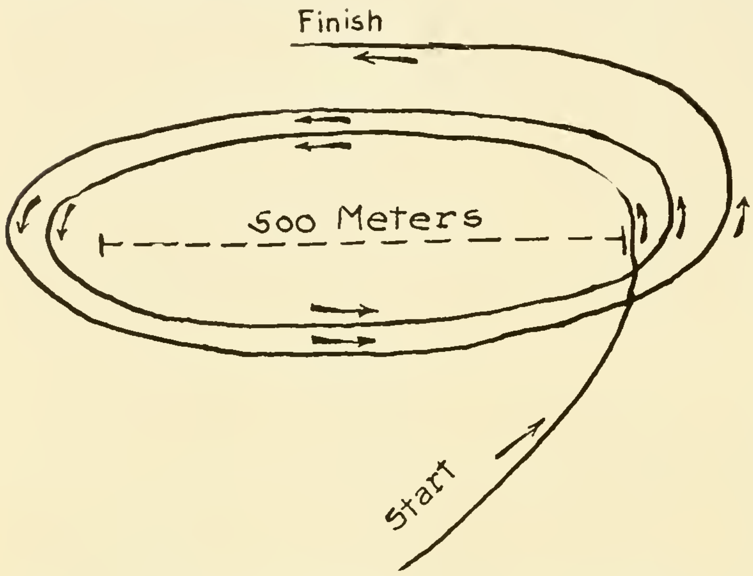
On March 14th Delegrange was out and made 300 meters with an Antoinette 40 h. p. motor, his personal record up to this time. The average height was 6 meters. Farman on the remodeled No. 1 accomplished several flights of 500 to 600 meters, using a 40 h. p. Renault air-cooled motor. The speed made was superior to that heretofore accomplished, as he made a curved flight of 600 meters in 19 seconds, which is equivalent to a speed of 100 kilometers an hour. Several very fortunate improvements have been made in the machine, and he hoped with an automatic process for air cooling, doing away with water, to outdo the results he has already obtained. He has replaced the silk covering of the planes with Continental caoutchouc, which, among other advantages, offers less resistance to the air and has complete impermeability. The extra light Renault motor used gave "the best satisfaction and gives good hopes for the future." General Kovanko, of the Russian Army, who was present, has just given a very important order to Voisin Brothers.

On the 16th Delegrange made five flights, covering in the first three distances between 200 and 500 meters. In the last flight of 700 meters at a height of 5-6 meters he was limited by the fence. The Antoinette 40 h. p. motor worked perfectly, and it is evident that the aviator is now thoroughly acquainted with his machine. Farman was also out, but did not fly, for which the motor might have blamed had it not been deprived of its "demultiplicateur." The monoplane Gastambide-Mengin did not quit its garage at Bagatelle.

The 17th saw Delegrange again in flight. The morning was employed in making adjustments. About 4 o'clock the club was officially notified that the aviator would make an attempt to win the "prize of 200 meters," 200 francs and a silver plaque for a flight of 200 meters. One of these three prizes offered by the A. C. F. had already been won by Farman. Although he covered 700 meters the day before, the flight was not an official trial. At 5:15 he took his position before the starting line. A flag had been planted 200 meters distant. The machine made a false start and touched the ground with two wheels as soon as the line was passed. He came back to the line and in a few minutes made another start and rapidly rose to about 3 meters altitude, keeping good balance. The flight lasted 21 1/5 seconds in a straight line. As soon as the apparatus touched the ground the judges measured the course and found it exactly 269.6 meters. Delegrange did not hide his joy at winning the prize and being placed in the rank with Farman. It may be remembered that Farman with a similar aeroplane covered officially 1000 meters on January 13, 1908, when he won the Deutsch-Archdeacon prize of $10,000, told in the February AERONAUTICS, and 770 meters

on October 26, 1907; and that Santos Dumont made 220 meters on November 12, 1906, winning two prizes, and 25 meters on October 23, 1906.

March 21—another history-making day! Delegrange and Farman. Decidedly, aviation advances. In the dense fog the frail appearing aeroplanes looked like spectres. Lining the fortifications was a horde of Paris gamins. The weather was uninviting, but expectation was in the atmosphere. Everyone wanted to see Farman beat his former record of the 13th of January, and they wanted to see Delegrange win. After the two flags of the A. C. F. had been planted the 500 meters apart—exactly, 501.2 meters—the flyers emerged from the garages like two immense birds. After some preliminary flights in the fog, which prevented seeing the distant points, Farman, having changed his Renault for the water-cooled Antoinette, 40, started on his long flight. After rolling 50 meters, he left the ground at a height between 3 and 7 meters. At one of the poles were the various officials of the club. Farman made two complete circuits of the course. The time was 3 minutes 31 seconds for a distance calculated to be 2004.8 meters. Taking into account the curve of the turning, the real course must have been nearly 4 kilometers in that short space of time. Farman had thus beaten his own record by tripling it.



As soon as Farman's machine was put away Delegrange started and made several creditable flights. At noon he described a superb loop, which measured 1500 meters, in 2½ minutes. Delegrange had beaten his own record also, but was unfortunately too late to win the Deutsch-Archdeacon. Then Delegrange offered Farman a seat on the machine. The two men stuck very close, one behind the other, and left at good speed. They covered 50 meters close to the ground. This was the first time that two men had ever flown in one machine; and the first that two machines had ever competed together and covered between them 5 kilometers in France.

The two machines are exactly the same model. The sustaining surfaces are made of two superposed slightly curved planes, of oiled canvas for Delegrange and of caoutchouc for Farman. They measure 10 meters in width by 2 meters front to rear. In front is a horizontal rudder for steering vertically, with a movable cell in the rear for guidance to left or right. The total length is 10.5 meters. Behind the aviator is a 40 h. p. Antoinette 8-cylinder water-cooled motor, driving a single 2-bladed aluminum propellor. The whole is mounted on a 4-wheeled chassis. The aeroplane leaves the ground at a speed of 40 kilometers an hour, or at the end of about 50 meters of rolling The wheels are mounted with springs which diminish the shock of landing.

AERO CLUB OF AMERICA.

The second annual banquet was held at the St. Regis on March 14th. The guests of honor were: Hudson Maxim; Gen. George Moore Smith; Major George O. Squier, Signal Corps; Colgate Hoyt, President Automobile Club of America; Dr. Alexander Graham Bell; Cortlandt Field Bishop, President Aero Club of America; Prof. Willis L. Moore, Chief U. S. Weather Bureau; McCready Sykes; Johnson Sherrick, President Aero Club of Ohio; Lieut. Frank P. Lahm, Signal Corps; J. W. Kearney, Secretary Aero Club of St. Louis.

Dr. Bell and the Aerial Experiment Association.

Dr. Bell in his speech told of standing with Prof. Langley and seeing the "flight of his prophetic aerodrome. He proved that navigating the air was a practical thing and within the control of man. The flying machine prophesied by Langley is no longer in the future—it is here. We have no longer to produce a heavier than air flying machine; we have only to perfect it as we have perfected the automobile.

"There are several machines in France that have gotten into the air and I am proud to be a member of the Aerial Experiment Association, that has just succeeded in getting into the air in America. The successful flight with the aerodrome, which has followed along the lines of the Wright brothers, is due to my associates and not one

bit to me. The 'Red Wing' was constructed under the direction of Lieut. Selfridge and generally on plans laid down by him and carried out by the engineers, Messrs. F. W. Baldwin and J. A. D. McCurdy.

"One great success has been worked by Mr. G. H. Curtiss, who has produced a 40 h.p. motor weighing 145 pounds.

"The aeroplane took a circular course, but the distance was taken in a straight line, 318 feet, 11 inches. This was the first public exhibition of the flight of a heavier than air machine in America.

"I think that we have a new agency of great importance in this Aerial Experiment Association, and it was suggested and has been carried out by a lady. It may be interesting, just for a moment, to speak of its origin, as I think it is destined to be productive of great things. In trying to construct my tetrahedral kite into an aerodrome I felt I had reached the limit of my own powers. I was afraid to put a man in the air without more knowledge of engineering. I wanted to be quite sure my structures were sound and so I associated with me two engineers, Messrs. Baldwin and McCurdy. Even with their assistance I didn't feel confidence, for I didn't know anything about motors, and so I associated with the motor expert of America, Mr. G. H. Curtiss.

"Along came Lieut. Selfridge from the War Department to see what we were doing. In conversation with this gentleman I found he had made a special study of heavier than air machines and knew everything being done abroad. A powerful combination if we could get together: two engineers, one military expert, one motor expert! My wife made the suggestion, 'Why don't you organize yourselves into a scientific association?' Mrs. Bell made the proposition to us that she would supply the capital necessary to carry on the experiments—all go in together to carry on scientific experiments until we got a machine into the air.

"This association started simply to help me to carry out my notion in regard to tetrahedral structures but the men composing it were of independent minds. The association came into existence so that we could help each other. It helped me to complete the tetrahedral structures and advance so far as to put a man into the air. The prediction that the structure had all the stability necessary was verified.

"The Association has established headquarters at Hammondsport. Here we follow in the footsteps of others. Selfridge, Baldwin, McCurdy and Curtiss have all made numerous gliding flights. They have gone to work to make this aerodrome "Red Wing," have applied a motor to it and have succeeded in putting it into the air."

Professor Moore.

Professor Moore told of his first ascension, in 1884. Donaldson was advertised to make an ascension at Binghamton and Professor Moore, then reporter on a Binghamton paper made the trip with him. When over the Chenango River, the balloon began to drop very fast. "Can you swim?" said Donaldson, "I can —— a great deal better than I can fly" was the reply, "and I disrobed. Donaldson was in tights—on a trapeze bar. But a breeze came along and we drifted over to land. That was my only experience in a balloon."

"The Chinese have been flying kites for a thousand years but have never made an aeroplane. They make no advance. They do what they do because their ancestors did. There is no Alexander Graham Bell of the Chinese to send the human voice over the metallic circuit, no Caesar, no Nopoleon. There is contentment and stagnation of thought."

He spoke of the high kite flights made at Mt. Weather every day since last September; that on no day was there a variation of temperature; that the air at the six mile level is above the effect of the lower currents. "We know very well that the temperature that causes storms ceases at 6000 feet."

Hudson Maxim.

"Now that the flying machine has become an actuality, and as all that now remains to be done is to perfect already existing means and apparatus in order to complete the conquest of the air, it is well for us to forecast some of the adjustments that will be necessary to meet the changed conditions when we shall have our aerial navies of commerce and of war.

"That the flying machine will find very wide application in future warfare, there can be no doubt. Furthermore, it will be the demand as an engine of war that will give to the flying machine industry its greatest stimulus.

"Inventors will have to delve in the depths of their genius in order to develop, perfect and bring the flying machine to the very high efficiency necessary to meet the requirements of government specifications.

"There is no other incentive to invention so great as that which impels to the development and perfection of implements of war, for the very security of property.

country, home and life itself often depends upon a little lead over an enemy in war inventions.

"The result will be that in the not distant future we shall have our aerial battleships, cruisers, torpedo boats, and torpedo boat destroyers, although they will be far different, of course, than those that sail the seas.

"Some terrible things have been predicted for the flying machine as a war engine. Many a sanguine inventor has claimed that with the advent of his flying machine, battleships, coast fortifications and cities could be utterly destroyed by dropping dynamite from the air.

"It is comforting to know that no very great loss of life or property would result from dynamite dropped from flying machines for the reason that dynamite requires confinement to work very wide destruction.

"Dynamite must penetrate and explode inside battleships, earthworks and buildings in order to do very great damage. Half a ton of dynamite dropped upon the four-inch deck of a battle ship might kill a few men, wreck some of the superstructure and dent the deck a bit, but the destruction would not be widespread and the crew below would be uninjured. Dropped on coast fortifications the damage would be negligible. Half-ton bombs dropped into the streets of a large city, or on top of the great buildings, would shake a few foundations, break a lot of glass and kill a few people, for the blast of the dynamite not being confined, would rebound up into the air in the form of an inverted cone and the effect in a horizontal plane would be small.

"But the flying machine will have very great use in war as a scouting craft for the purpose of locating an enemy and inspecting his position; but the enemy will have his aerial pickets out, and there will be many a tilt in the air between the warring craft. Then it will be that speed will count for much and there will be intense rivalry between the nations in the production of flying machines that will fly fast and fly high, for those able to fly the highest will have a tremendous advantage over their enemies. It will be the high flyers who will win.

"Do not let the inventor think that the employment of the flying machine as a war engine is an ignoble one, for it is not. It is the most noble use of all."

On Monday, March 4, Mr. Stanley Y. Beach gave a lecture on the machines abroad. The meeting was very well attended.

The following addition to the By-Laws has been proposed: "No member shall take part in any contest in the United States which is not organized by the club, without the consent of the committee in writing." The name of the "committee" is not given.

Conditions of competition for the Scientific American cup will be made more strict on August 1st, and prospective contestants are urged to "get their machines in condition as soon as possible."

AVIATION SECTION OF THE AERO CLUB OF AMERICA.

The Aero Club of America, at a general meeting on April 6, formed an Aviation Section for the purpose of particularly encouraging experiments and providing opportunities for carrying on experiments with gliding machines and all types of gasless apparatus.

A committee, consisting of A. C. Triaca, S. Y. Beach, Lee S. Burridge, Wilbur R. Kimball and D. L. Braine, has been appointed to locate suitable grounds for demonstrations, to provide motors for the use of experimentors, a repair shop for small repairs, etc. It is expected to enlarge this shop to such proportions that entire machines can be constructed at cost price for members of the Section.

A meeting room will be provided as soon as possible for members of the Section at the experimental grounds. The members of the Aero Club of America will, of course, be entitled to visit the grounds, but will not participate in the active privileges of the members of the Section except by joining the Section.

A large membership is earnestly solicited in order to enable the rather extensive program to be carried out. The membership has been decided at $10 annually, to include all privileges of the Section.

Every endeavor will be made to secure offers of prizes to reward creditable flights and enable the successful aviators to further prosecute their researches.

Among the advantages which may be expected to accrue to members of this Section are the following:

The use at any time of the grounds for trial flights;

The use of sheds or the privilege of erecting sheds for the housing of apparatus;
The use of a repair shop, which is expected to develop as fast as possible into a complete machine shop for the building of entire machines;
The use of a club room at the grounds;
Weekly bulletins from Paris, already arranged for, mailed to each member;
The use of motors belonging to the Section;
Monthly lectures, illustrated with slides and motion pictures of the new machines here and abroad as they are tried out.
Aid and advice from mechanical, electrical, aerodynamic and motor experts;
The use of a most complete aeronautic library of old and contemporaneous books and periodicals in all languages;
The privilege of competing for the following prizes: Scientific American Trophy; Michelin annual prize of $4000 for a flight of 12 miles; Triaca annual prize of $100 for the longest flight during the year; and others offered abroad which are international in character.
Contests for cash prizes will be arranged from time to time.

Write for circular and information to Aviation Section, Aero Club of America, 12 East 42d St., New York.

GORDON BENNETT 1908.

The third contest for this cup will be held on October 11 at Berlin. Twenty-three entries have been received, as follows: America 3, Belgium 3, England 3, France 3, Italy 3, Spain 3, Switzerland 2, Germany 3.

The Italian contestants will be Sr. Usuelli, with the balloon "Ruvensori," of 2250 c.b.m.; Prince Borghese, with the "Aetos," of 2250 c.b.m., and Sr. Frassinetti, with the "Basiliola," 2200 c.b.m. The English contestants will be John Dunville, Prof. A. K. Huntington and Hon. C. S. Rolls. Belgium will be represented by M. Demoor in the "Belgica," of 1680 c.b.m., M. Leon de Brouckere, in the "Ville de Bruxelles," of 2200 c.b.m, and one other, which will probably be named by the Aero Club des Flandres, an affiliated club of the Aero Club de Belgique. The "Belgica" will be a new Mallet balloon. The Aero Club of St. Louis has made application to enter one balloon in behalf of America.

To represent Germany, 11 balloons have been offered. The Committee sent each of the clubs composing the Deutscher Luftschiffer Verband a notice that as the foreign competitors had all entered large balloons, no offer of a smaller balloon than 2200 c.b.m. could be accepted. Of course, Herr Erbsloh is obviously the first champion. The other two pilots will be selected under the certain conditions. The applicants must give the following information:

The number of prizes won in contests.

The number of kilometers traveled and hours consumed in these contests.

The total number of all flights previously made, with total distance and duration.

Record flights or especially long ones.

The answers to these questions must have been received by the Committee by April 1st. If it is impossible to agree upon the selection of any two particular pilots from considering their past records, an elimination contest is to be held between the two applicants, the time and place for same to be decided by April 15.

In referring to the race of 1907 at St. Louis, Major Moedebeck calls attention to the fact that "the French balloon 'Isle de France,' pilot Le Blanc, in the Gordon Bennett 1907, had a capacity of 2400 c.b.m., while the rules place the limit in size at 2200 c.b.m., with an allowance of 5% in excess, or 2310 c.b.m. total." Acting in strict compliance with the rules, the Aero Club of America should have refused the entry of such balloon, which, it will be remembered, made the second best duration record of the world, 44 hours 5 minutes.

On Oct. 10 distance contests and contests for a specified objective point will be held.

The city of Berlin offers free the gas for the Gordon Bennett race.

This is the last year in which a cash prize of $2,500 is offered in addition to the cup, Mr. Gordon Bennett having agreed upon offering the cup to donate $2,500 yearly for three years.

Aviation on Venetian Canals.

Dispatches state that an international aeroplane contest will take place at Venice during October. Prizes amounting to $5,000 will be available.

INTERNATIONAL AERONAUTICAL CONGRESS.

President: Professor Willis L. Moore.
Secretary: Dr. Albert Francis Zahm. Chairman Gen'l Committee: Wm. J. Hammer.
Chairman Executive Com.: Augustus Post. Sec'y Committees: Ernest La Rue Jones.

Publication Notice.

The addresses, papers and discussions presented to the Congress will be published serially in this magazine, and at the earliest date possible, bound volumes will be distributed without charge to those holding membership cards in the Congress. Others may purchase the volume at a consistent price when ready or may take advantage of immediate publication by subscribing to this magazine at the regular rate.

In accordance with the program as published in the November number, the informal addresses of the Gordon Bennett contestants and others were concluded before entering upon the printing of the formal papers and discussions.

The eighth and ninth papers are presented in this issue.

EQUILIBRIUM AND CONTROL OF AEROPLANES.

By L. J. Lesh.

There is a certain problem in the theory and practice of aeronautics which has been rather neglected by the majority of recent dynamic experimenters, generally with disastrous results.

I refer to the balance and steering of aeroplanes, a subject which must be absolutely mastered by the experimenter who hopes to develop a flying machine of any type. Unfortunately, previous investigators have failed to give any precepts or data concerning this problem, either because they had none to give or because they thought their secrets too valuable to make public.

To me, this latter excuse seems unnecessary for it is highly improbable that any experimenter could get ahead by following up the ideas of a man who had the advantage of several years experience. Of course there are exceptions, such as the case of the French aviators who imitate in appearance but not in success, the machines of Professor Langley and the Wright brothers, but even the Frenchmen begin to see that they are on the wrong track.

As one close observer has put it, "there are two ways to learn to ride a balky horse: by working out on paper just what moves a man would have to make to get the best of him (data obtained by observing his antics from a safe distance) or by getting into the saddle and finding out by experience."

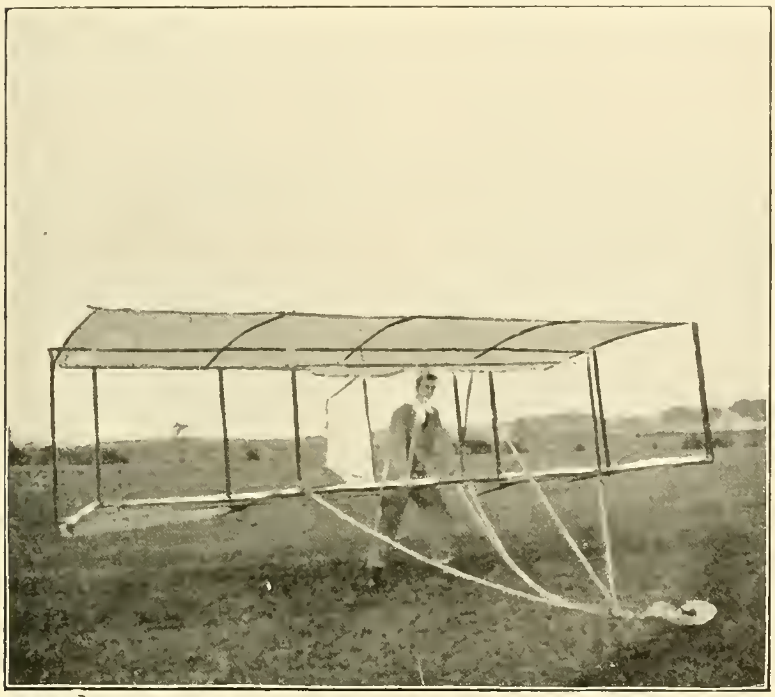
Substanially the same thing is true concerning aviation, and a very brief glance at the history of aeronautics reveals which method has given the best results. Laboratory data are valuable only when based on information gained in actual field experiments and mathematicians desiring to contribute their calculations concerning mechanical flight would do well to learn the practical side of the proposition so as to produce more useful material.

Equilibrium.

An aeroplane moving freely through the air is in a state of equilibrium when its center of pressure coincides with the center of gravity. Unfortunately this state of things exists only when the machine flies in perfectly still air, and even in a calm some defect in the construction or adjustment of the apparatus may cause a disturbance in the equilibrium.

Projected forward in a wind, a machine must be cleverly designed and adjusted indeed to preserve inherent stability and beyond certain limits it will not fly at all unless the controlling agent is human intelligence.

Although "model flight" is a rather uninteresting proposition to the would-be aviator, sound in mind and body, I should commend a series of experiments of this kind preparatory to work with a full sized aeroplane. By flying small paper models the investigator becomes acquainted with the merits of variously shaped wings and the travel of the center of pressure under various conditions.



GLIDER NO. 2 OF L. J. LESH.

The experimenter learns that in arrangement of supporting wings, aeroplanes follow two general systems: the single support type having the center (or centers) of pressure approximately on the same vertical straight line; and the type having two or more centers of support placed consecutively from front to rear.

The Lilienthal, Pilcher and Chanute gliders are examples of the first class of machine and the Langley, Wright and Dumont flyers will serve as illustrations of the second type. A careful study of the design of these six machines representing the various types of successful flyer, leads one to some interesting conclusions.

The Lilienthal and Pilcher machines possessed very little inherent stability, required remarkable agility on the part of the aviator, who steered and balanced the apparatus by shifting his weight, and were unsuited for dynamic flight.

The explanation of these difficulties is found in the arrangement of surfaces, which consisted of two large and wide supporting wings arched from front to rear and tilted laterally at a dihedral angle (forming an unstable craft in a gusty side wind) a tail tilted steeply upward, placed at the rear of the main surfaces, its object being to prevent the wings from tipping over frontwards, and a vertical fin which prevented the apparatus from swerving unduly to one side.

This arrangement is about as unstable as one could wish and its management makes one think of that circus feat which consists in riding a one-wheel cycle. Indeed the two devices are quite similar in reference to the principles of equilibrium concerned—for in one the trick consists in keeping the center of gravity over the center of the pressures exerted on two large artificial wings, while in the other success depends on the rider keeping himself directly over the point of contact of his wheel.

Chanute's machine, although it was also of the "single support" type, embodied some changes in construction and design which were a distinct improvement over former practice. He ingeniously applied the principles of bridge design to the construction of his gliding machines and overcame, in part, the difficulties of balancing, by the use of semi-flexible or pivoted wings and rudders.

The second or "double support" type mentioned in my classification of flyers might be subdivided again into the Langley type of machine, consisting of two consecutive supporting surfaces with the center of gravity placed between; and the Wright type consisting of a single main support practically coincident with the center of gravity, and a forward rudder which lifts slightly and therefore forms a second center of pressure.

Blériot's recent flights have demonstrated the inherent stability of the Langley type of machine which, having two centers of support, is more stable than the single support type for the same reason that a conveyance having two wheels is steadier than a monocycle.

The arrangement of supporting surfaces used in the Langley type of machine puts it at a material disadvantage, however, for the front wing cutting the wind into eddies as it passes, interferes with the action of the next following surfaces. This has been termed "interference."

Blériot has effected a considerable improvement over the Langley design by placing the rudder at the front of the aeroplane instead of at the rear, but the principal defect, "interference," has not been eliminated and the machine is still relatively inefficient.

Apparently, experimenters have not yet arrived at the most efficient system of aeroplane surfaces; for in one case "interference" has been practically eliminated (with a resulting loss of stability), while in the other, excellent equilibrium is assured but the surfaces lose their efficiency.

It is probable that the best arrangement would be a system of surfaces providing two centers of support with the weight of motor, operator, etc., located between them. In order to reduce the "interference" and improve the control of the machine it would be desirable to place the controlling surface in a position where it would support a part of the weight and assure a positive control. This could be made possible only by the use of a rudder placed in advance of the main wings.

To obtain this arrangement with the rear supporting surfaces curved to the arc of a circle or with their curvature forward of their center of figure, would necessitate (unless the forward surface be prohibitively small), the weights being placed somewhat in advance of the rear center of pressure and this would introduce new and objectionable complications of construction.

After arriving at these conclusions I proceeded to undertake a series of experiments with models, in hopes that some satisfactory arrangement would be evolved. As the work proceeded I became convinced that in order to produce a practical "two support" machine it would be necessary to design the main supporting surface in such a way that its center of pressure would be near the rear edge of the wing.

The answer to these vexing problems came when it was found that a supporting surface curved slightly downwards at its rear edge possessed excellent stability when balanced by a forward rudder, and permitted the placing of the weight between the two centers of support thus formed. My recent experiments with this system applied to a full-sized man-carrying aeroplane have proved it to be practical and efficient.

After the working efficiency and inherent stability of a flying machine are satisfactory, the problem of manipulating the surfaces to produce horizontal and vertical changes in the direction of flight may be taken up.

Control.

Since steering is largely a matter of skill, and skill in managing an aeroplane can only be acquired by actual practice, the problem will require but little treatment here.

The efficiency and versatility of the system of control will depend on the balancing of the rudders and arrangement of the controlling ropes or levers.

The horizontal rudder should be so balanced that it will return to a horizontal position when not under the control of the operator and the vertical rudder should move freely in its sockets, assuring positive action.

The arrangement of devices for moving the rudders will obviously depend on the position of the aviator in the machine. If the operator assumes a horizontal position in flight, the surfaces may be manipulated to the best advantage by controlling cords passing within easy reach, while if he assumes a sitting posture or hangs suspended by his arms, levers will generally be found most convenient.

I have found that an aeroplane may be steered to good advantage by the use of a "Chanute type" rear rudder connected to the main wings by a single spar and universal joint, the steering being done by controlling lines passing in front of the aviator. I found it necessary, however, to shift my weight when quartering into the wind with this arrangement, for side gusts caused a lateral oscillation of the surfaces which could not be overcome by the rudders without changing the direction of flight.

It occurred to me that these troubles could be overcome by the use of two individual horizontal rudders, and the arrangement was accordingly installed in my experimental machine. The tests demonstrated that with the new device it was possible to quarter into the wind with the wings parallel to the ground, the control being effected by the use of the two horizontal rudders alone.

I believe this system of control to be efficient and hope in the near future to install it in a motor aeroplane. Its most valuable feature will be its ability to overcome the torque of the propeller if a single screw is used for propulsion.

CONSTRUCTION AND EQUIPMENT OF WIND-TUNNELS.

By Dr. A. F. Zahm.

(*As Dr. Zahm was unable to write out his paper, he made an impromptu address which is here published from the stenographic reports of the Congress*).

In determining the atmospheric resistance of bodies there are two general methods that may be followed. One is to propel the bodies against still air, the other is to drive the air in a uniform current against the bodies. By uniform I mean constant in velocity and direction. These two methods should give identical results. I take this as a self-evident proposition.

The first method has been quite generally used for several generations. Originally the bodies were dropped from high places. Sir Isaac Newton determined the resistance of a sphere by dropping it from the dome of St. Paul's cathedral. Others later determined the resistance by placing the wind objects on the end of a long arm of a whirling table. And others again on a car running on a rectilinear track.

These methods have furnished useful data, but they present difficulties. If the bodies fall vertically the speed is not constant and the resistance of the air exceeds that for steady motion. The objection to the whirling table, if the experiment be made in doors, and drift wind be generated, is that all the air of the room circulates with the arm of the whirling table and, therefore, it is impossible to say what the true velociy of the body is with reference to the air. If made out of doors there are almost always some wind currents that mar the accuracy. If the experiments be made on a rectilinear track, which is an ideal method, they must be made out of doors, or in a large building. Professor Langley was very much annoyed by wind currents and finally decided to try in doors, and he found a building suitable for that purpose, about fourteen hundred feet in length. He proposed to place a car on a rectilinear track,

in this building, place the bodies on the car, and have them moved at a regular speed.

A method that has come into use quite generally in recent years is to drive the air against the body. If it were possible to find a uniform current of air out of doors, we will say blowing over an extended tract of water or a level surface of the earth, these experiments might be made in the natural wind. I would ask our meteorological friends what they think of that proposition. What kind of winds can we find in the most favorable localities? How much do they vary during the time necessary to take careful observations? That is to say, one minute. If the velocity be constant for one minute to within one or two or three per cent., such a wind would be very useful for measuring the resistance of many shapes important in engineering. But in the laboratories I speak of winds are generated artificially.

A very small wind tunnel was built by Professor Marey in Paris. The tunnel was vertical, had a netting for fine mesh closing its top and a suction fan at its bottom. The suction fan drew the air through the screen-closed mouth of the tunnel, then passed it through the tunnel in uniform straight lines. By this simple device he was able both to measure the resistance of the bodies and to determine the action of the air as it flowed about the bodies. For instance, he would place a sphere in this current and observe the stream-lines as they flowed around it. This could be done by allowing fine particles, or fine threads, to float in the current, but very much more satisfactorily by means of a great many fine streams of smoke. Across the tunnel he constructed a large comb with hollow teeth. Smoke was admitted into the body of the comb and came out of the ends of the teeth, and these smoke streams moved in parallel lines till they came to the object, and then passed gracefully around, if the shape was "easy," but broke into eddies if the body was blunt. Around the front of a sphere they would bend very smoothly, but towards its rear they would break into eddies and then there would be a long wake below the sphere. In the case of a wing surface, the inclination being comparatively small, the stream-lines would begin to bend a short distance in advance of the forward edge of the wing. Part of the stream-lines would bend gracefully over the top of the wing-surface and smoothly close at the rear of the surface and unite with those which passed underneath. Of those that passed underneath, some were bent smoothly and others were disturbed, broken into eddies.

I have observed some of Professor Marey's photographs. I must mention that these stream-lines were photographed by an instantaneous process. The photographs show the stream-lines very clearly, where they bend smoothly, and where they are broken into eddies. In addition to that, the stream-lines will give the actual velocity, because he made the comb vibrate. An electric motor caused the comb to vibrate 10 times a second regularly. That caused all the stream-lines to have a wavy form. Looking at the photographs, you observe the stream-lines beginning at the comb with all the waves parallel. Then, as they approach the wind body, some move more rapidly than others. By counting the number of these waves along each inch of the photograph, you can tell the velocity of each part of the current.

I might say a word as to how the velocity is commonly measured in other wind-tunnels. In the wind-tunnel of the National Physical Laboratory of England, the Pitot tube is used. In my tunnel the Pitot tube is used. In the laboratory of Koutchino, a very different method is employed. The velocity of the wind in the tunnel is directly proportional to the fan speed, so that, when the fan speed is known, the velocity inside the tunnel may be read off from a table, providing the wind object in the tunnel is not very large. If the Pitot tube is used to measure the wind speed, it is necessary so to construct its static orifice that it will not disturb the stream-lines. I will make

a picture to illustrate. Let us suppose that the wind is blowing directly into the mouth of a tube connected with an anemometer. Then the impact of the wind will generate a pressure in this tube. If we know the static pressure in the undisturbed stream, we can immediately compute the velocity of the wind. In order to determine that static pressure, it is necesary to have the air enter another tube undisturbed. The other tube may be co-axial with the first tube mentioned. If a hole is made on the convex surface at some distance from the end of this co-axial outer tube, air will flow into it undisturbed. The stream-lines of the air will be undisturbed as they pass that orifice, and the pressure of the air inside the outer co-axial tube will be the same as in the unchecked, undisturbed stream in the tunnel. Now, if the pressure in the two tubes is observed in a manometer, and the difference between those two pressures taken, the velocity of the air may be read proportionally to the square root of this differential pressure.

Many engineers have used the Pitot tubes and have applied the impact at the mouth correctly, but have not used the proper precaution in getting the static pressure. For example, one method is to erect a tube at right angles to the wind current and take the pressure that exists at the mouth of such an orifice. The results are unreliable, because the stream of air bends around the mouth, and a partial vacuum is created. The stream-lines are disturbed; therefore, the static pressure inside the tube is not the same as the static pressure in the unchecked stream.

Two Italians, Dr. G. Finzi and Dr. N. Soldati, have investigated this subject, and find that the true static pressure in a current may be determined very accurately by using a thin disc. A thin metal sheet placed over the static orifice will prevent the disturbance of the stream-lines, so that the air will flow in a uniform stream, unbent, undisturbed. And, therefore, the pressure obtained at the static mouth is the true pressure in the unchecked stream.

Of course, there are other methods of measuring the wind velocity which are familiar to every one here. Having obtained a wind of uniform velocity and direction, the wind objects are supported inside the wind tunnel on a balance, and the pressures of the air are measured just as one weighs off sugar in a balance.

Mr. Herring: You said that the pressure is measured off directly in the tube; but aren't the effects of pressure of a moving stream on any body composed of pressure in the front and suction in the back? That would give a different value from the direct impact of the air itself.

Dr. Zahm: .That is a very important consideration when you are determining the wind pressure at a particular point about a model. What I am attempting to do in this case is to measure the velocity of the unchecked wind current in the tunnel before it reaches the body.

Mr. Herring: Measure its velocity instead of its wind pressure?

Dr. Zahm: I am merely describing an anemometer now. I am very glad of this suggestion, because the Italians to whom I have referred have written a very valuable document, in which they have shown how to determine the actual pressure of the air at every point of a surface of any form. They have investigated, for example, the unit wind pressure all over the surface of a torpedo shape, and they have reached the remarkable result that the resultant pressure on the torpedo-shaped body is zero. The pressure in front is just balanced by the pressure of the stream-lines closing in the rear, pushing the torpedo forward. It has been known for a ling time that when a torpedo-shaped body, or a sphere, or any form, passes through a frictionless liquid the resistance is zero when the velocity is unifom. Professor Langley assumed this to be true for the hull of a flying machine moving through the air, because at that time he was not aware of the effect of viscosity and skin-

friction. The experiments of Finzi and Soldati bear out Langley's assumption. Langley assumed that a fish-shaped body moving through the air has a resultant pressure, which is zero, the pressure on the rear balancing the pressure on the front. When such a body is placed on the balance in a wind current, it is found to have a finite resistance. It may be a considerable resistance. I should judge, then, comparing the results of Finzi and Soldati with the actual total resistance, that this resistance must be largely frictional. Of course, since I have measured the absolute skin-friction in my wind tunnel at Washington, I can state absolutely and positively that there is such a thing as skin-friction, and I can give its law, and the magnitude for any velocity; and so it is possible to explain the existance of a resultant force on a wind object, even if we assume the aggregated pressure all over the surface balanced and neutralized.

To answer Mr. Herring's question more fully, I would say that, while the static and impulsive pressures at the nozzle of the Pitot tube are used to compute the wind speed at a point well away from the model, the resultant wind force on the model itself is measured, in my tunnel, by means of a bell-crank balance. The knife edges and horizontal graduated arm of the balance are above the ceiling of the tunnel, on the outside; the vertical arm runs through the ceiling into the tunnel (being protected from the wind by a surrounding tube fastened to the ceiling of the tunnel) and supports the wind model at its lower end. The resultant wind pressure on the model is determined by sliding weights on the horizontal graduated beam outside.

Thus by means of the two instruments—the Pitot tube and the bell-crank balance,—the velocity of the undisturbed air, and the resultant wind thrust on the model are measured, but nothing is revealed as to the unit pressure at each point of the model's surface. To determine this latter, one may use the manometric method of Drs. Finzi and Soldati, just referred to. In other words, my balance gives the resultant wind thrust, including skin-friction; their manometer gives the unit pressure at each part of the model, but ignores the skin-friction. A combination of the two devices would give the unit pressure at every part of the model, the resultant pressure and the resultant skin-friction, but not the unit skin-friction at each point. This latter quantity, so far as I am aware, has never been measured directly.

THE NEW BALDWIN DIRIGIBLE.

Captain Thomas S. Baldwin, who has the contract to build the Government dirigible, is busily engaged in constructing an experimental airship which will be thoroughly tested out before work is started on the one to be supplied to the Signal Corps. A great deal is expected of the twin propellers, and special work is now being conducted for the purpose of testing the efficiency of certain new shapes. The material of which the bag is to be made is altogether new. Between two layers of silk is a thin composition layer. The effect of the sun's rays, which are so detrimental to rubber, will be made nil in this new fabric. The specifications of this trial airship are as follows:

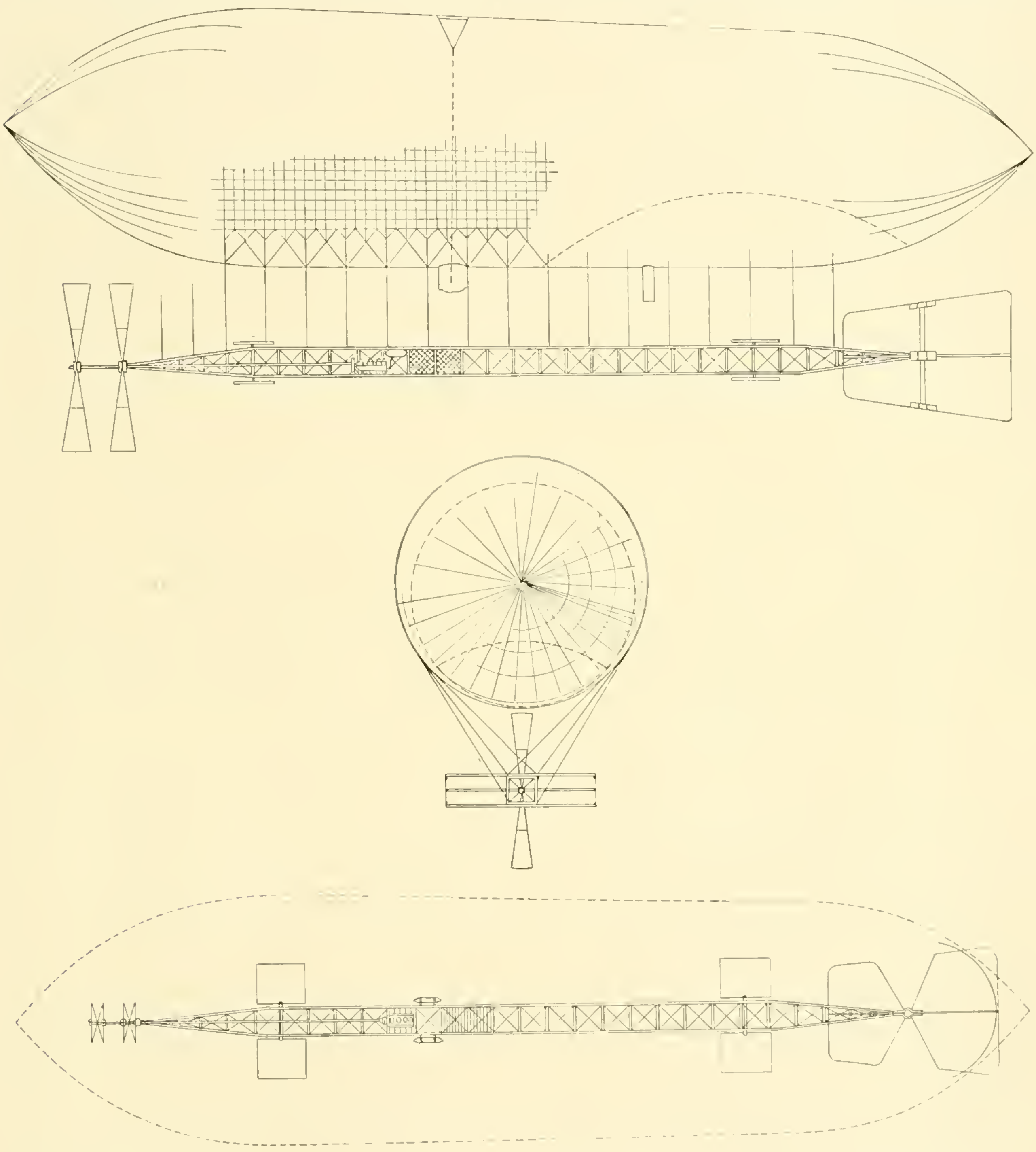
Gas Bag—Form, ogival; double-wall cemented silk with a breaking strain of 75 x 75 pounds per inch width. Length, 58 feet. Greatest diameter, 16 feet; smallest diameter, 14 feet. Capacity, about 8,000 cubic feet. Envelope with 3 layers of material fore and aft with reinforcements where required. Twelve-inch plunger valve at the top. Ten-inch pressure valve at bottom. Inflating neck, 6 inches. Ripping strip, 5 feet.

Netting—Entire envelope encased in square mesh linen netting, with a working strain of 9,000 pounds. Invented by Captain Thomas S. Baldwin; application filed November 21, 1904, No. 851,481. Netting suspension is so arranged that when on an even keel the forward end will have an upward tendency, causing the pressure of the gas to be strongest where it is met with the greatest resistance. The under part of the gas bag, where the suspension cords leave the netting, is covered with elastic bands to take a portion equal to the displacement of a balloonet, and holds the gas bag tight

at all times. The netting is so adjusted that in case of collapse it would form a parachute and permit a safe descent. Attachment of the gas bag and the frame is the "three-way suspension," which holds the gas bag and frame absolutely rigid.

Frame—Square cross-section of spruce, 1⅛ x 1⅛-inch, bolted together with ⅝ x ⅞-inch strips. Operator's section is 3 x 3 x 6 feet. Frame is built in convenient lengths for shipment.

Propellers, Planes and Rudder—The twin screw propellers are placed forward and have a diameter of 8 feet, with a pitch slightly less than the diameter. They drive in



opposite directions on the same shaft at a speed of about 250 r. p. m. The shaft is of Shelby steel tubing mounted on ball and roller bearings. There will be four planes 3 x 3 feet for regulating the ascent and descent, and keeping the ship on an even keel, worked in unison from the operator's section. The rudder, propellers and planes will be of tubing, spruce, bamboo and silk.

Motor—The motor will be a specially-designed Curtiss of 20 horsepower, 4-cycle, 4-cylinder (vertical), air-cooled, magneto-ignition, cast-iron cylinders. The crank case will be of McAdamite. The shaft is a four-throw, hollow vanadium steel, with Parsons' "white brass" bearings. The weight is approximately 200 pounds. Enough fuel will be carried for a two hours' flight.

HYDROGEN AT LOW COST TO ADVANCE BUILDING OF DIRIGIBLES.

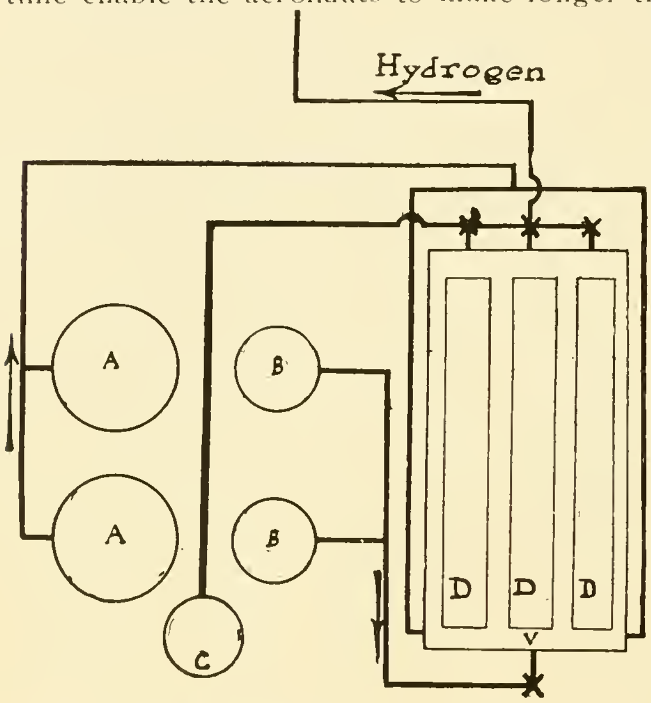
By Albert C. Triaca,

General Director International School of Aeronautics.

Up to the present time the inflation of spherical balloons with hydrogen has not been practically realized on account of the high cost of this gas, which has never been less than 20 cents, in France, the cubic metre, while the price of coal gas is 3 cents per cubic metre.

If one could produce hydrogen at a moderate price, equal, if possible, to the cost of coal gas, he would render an immense service to aeronauts in giving them a gas lifting from 11 to 12 hundred grams per cubic metre.

Using hydrogen we can have smaller balloons. This means the lessening of the expense for fabrics, the cost of the journey back home, and greater facility in handling. Of course, gas holders for hydrogen must be stronger and will be somewhat more expensive, but they will give greater service and by holding the gas for a longer time enable the aeronauts to make longer trips.



A = High Grade C = Boiler
B = Wilson D = Retorts

Cheap hydrogen will aid greatly in the development of dirigibles for pleasure use instead of being used by Governments for war purposes only. Perhaps next Summer we can have a great number of small private dirigibles, with contests between them.

It was to the realization of the production of hydrogen at low cost that Mr. Howard Lane applied himself, and these are the results of his researches.

Hydrogen is prepared from the decomposition of water through iron in presence of sulphuric acid; from the decomposition of steam through iron or coal at high temperature; and chiefly by electrolysis, which furnishes a gas chemically pure, but at a cost price of nearly 2 francs per cubic metre.

It is the industrial application of the decomposition of steam through red hot iron that is the basis of the Lane process, and it is that which has been able to accomplish the manufacture of hydrogen gas at a cost of 1 franc (19.3c.) per 10 cubic metres (353.14 cu. ft.).

This apparatus has already proven its excellence, since it has been adopted by the Russian Government, which has successively ordered two plants capable of producing respectively 200 cubic metres (7062.80 cu. ft.) per hour.

The English Government has also installed at one of its aerostatic parks, South Farnborough, an apparatus of the same capacity. The officers who have experimented with it there, and who were present at the long trials, are unanimous in declaring that the gas thus obtained is of as good quality as that from the electrolytic process, reaching a degree of purity of 97 per cent. The Royal Batallion of the Prussian aeronauts has asked the Minister of War for a plant of the size above mentioned.

The installation realized by Mr. Lane is essentially composed of an oven in which are three series of retorts; of a special generator, high grade (AA); and of a generator of the Wilson type (BB). Besides the oven with retorts and generators, and a small steam boiler, there are also other accessories and mechanical parts of which it is not necessary here to give a description.

In order to well understand the work of this installation we will give some explanation about the two generators just mentioned.

The high-grade generator is an apparatus capable of producing, with ordinary combustibles, and even with bituminous coals, a gas of a very high quality and of a high calorific power. This gas, according to the combustibles used for its production, has a richness in hydrogen varying from 40 to 48 per cent.

The Wilson type generator recalls the old Siemens oven, which worked by natural draught without the use of steam and which rendered great service for the heating of ovens. With the Lane apparatus one can use not only ordinary coals and cokes, but also wood and inferior combustibles. The gas produced in this apparatus is sent directly, in a hot state, through special pipes to the parts which are to be heated. The retorts in the oven mentioned above contain pieces of iron.

These are the three principal organs of the installation. We will see now how it works and how one can obtain hydrogen of a good quality.

The retorts are heated red hot with the gas produced by the Wilson type generator. Then a draught of steam is made to go through the iron contained in the retorts for each one of the series contained in the oven. The steam is decomposed and hydrogen is formed until the complete oxidation of the iron. When this oxidation is accounted for, the same operation is gone through for the other series of retorts. During this new operation a current of gas coming from the high-grade generator is introduced into the series of retorts where the oxidation is produced. This gas has the virtue of combining itself with the oxygen of the magnetic oxide of iron remaining in the retorts and to revivify the iron, at the same time obtaining some steam and carbonic acid. This iron can again be utilized for producing hydrogen as soon as the iron contained in the series of retorts will be completely exhausted. During the new production of hydrogen the revivification will be made.

These operations can be repeated indefinitely and can be summed up in the following chemical equations:

$$3\,Fe + 4\,H^2O = Fe^3O^4 + 8\,H.$$

$$Fe^3O^4 + 2\,CO + 4\,H = 3\,Fe + 2\,CO^2 + 2\,H^2O.$$

The hydrogen thus produced in the retorts is sent to a special washer, then in a purifier and from there to its utilization. The analysis of the gas thus obtained is as follows:

Hydrogen (H_4)	97.20
Formene (CH^4)	1.80
Azote (Az)	1.00
	100.00

Finally, it is interesting to establish the cost price. First, 30 kilos of coal at 12 francs a ton (in England) produce 10 cubic meters of gas; second, an apparatus able to produce 200 cubic meters per hour is worked by four men earning each a maximum of 1 franc per hour; third, one can allow a loss of 30 centimes per 10 cubic meters. One will then have:

Coal (30 kilos at 12 fr. a ton)	0 fr. 36c.
Labor $\frac{1 \times 4 \times 10}{200}$	0 fr. 20c.
Loss	0 fr. 30c.
Unforeseen	0 fr. 14c.
Per 10 cubic meters	1 fr. 00c.
1000 cubic meters (35,000 ft.)	$19.30

Such in brief, are the advantages resulting from the use of the Lane system for manufacturing hydrogen at low cost.

I believe that because of the geographical position of New York, it is not an easy matter to take balloon trips, by reason of the nearness of the water and the strong winds which frequently prevail. It would be very interesting to have a factory for producing hydrogen at low cost. The time is coming when you can build an airship at a less cost than a 24 horsepower automobile. This is a question of only a few months. In France there was organized two weeks ago a Company especially for the construction of airships. In this company are interested M. Maurice Mallet, the well-known aeronaut, Count de la Vaulx and M. Schelcher of the Panhard-Levavasseur firm. Certainly hydrogen at a low price is the greatest aid to the development of dirigibles. On account of high winds you cannot return with your airship to the starting point. It will be an easy and not very expensive matter to use the ripping cord in your dirigible as in any ordinary spherical balloon. The Aero Club of France will have this Spring the Lane hydrogen system installed at its own park at St. Cloud, Paris.

I believe it is not very far distant when we can have dirigible races from New York to San Francisco. As we now have gasoline stations, we can have hydrogen stations in all parts of the country, and travelling with an airship will be more easy than with automobiles, without danger of collision, without the annoyance of customs houses and without the traps and fines of the police

Note: The information about the Lane system is taken from Aerophile of July, 1907.

BALLOON SPEED RECORDS.

Carl E. Myers.

Under this head a recent balloon voyage from Pittsfield, Mass., to Hampton Falls, N. H., 130 miles in 3 hours time, or 43 1/3 miles per hour, is thought "possibly better than has been made anywhere," and better than made by the same party last fall from Pittsfield to Short Beach, Conn., a distance of 84 miles, in two and one-half hours, at a rate of 33 1/5 miles per hour.

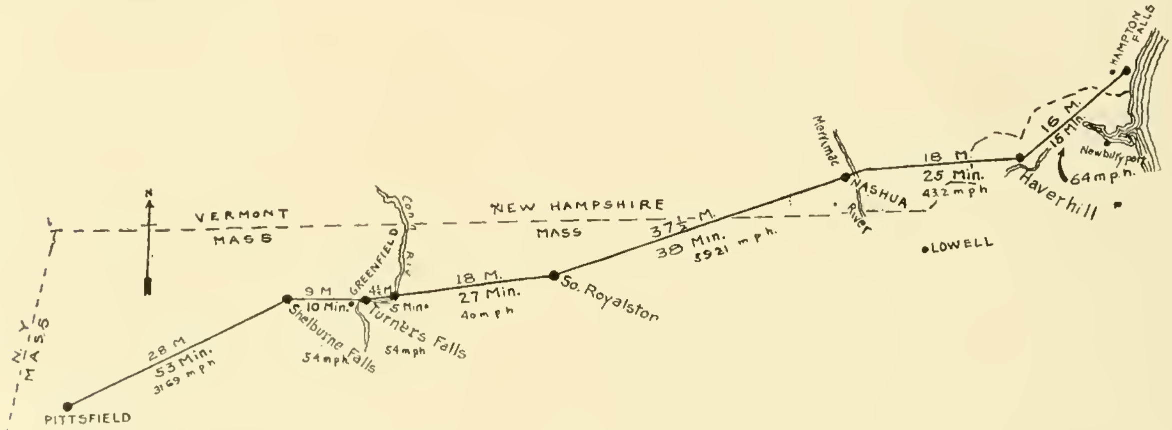
Prof. John Wise exceeded this nearly 49 years ago when in July, 1859, he made a balloon trip from St. Louis, Mo., with three companions, nearly 1200 miles in length of course, and over 800 miles in air line in about 18 hours, or at a rate of about 45 miles per hour.

In Sept., 1886, Mrs. Carl Myers of Frankfort, N. Y., made a balloon journey from Franklin, Pa., to Kinzua Bridge, a distance of 90 miles in 90 minutes, at a speed of 60 miles per hour, which so far as known is the world's record. Her balloon arose to over 4 miles elevation, the highest record in America, and is notable also as being the first made with natural gas from the earth. Thus the work of a woman is the aeronautic record today. The natural gas on this occasion arose from the wells at a pressure of 700 pounds to the square inch, and was brought through pipes thirty miles to the place of ascension.

MARCH ASCENSIONS.

Mar. 9.—A. Holland Forbes (A. C. A.) alone from North Adams in the "Stevens 22" (22,500 cu. ft.) at 11:25 a. m., landing half-way between Wilbraham and Monson, Mass., at 1:02 p. m. Distance, 58 miles. The ascension was made with the idea of qualifying in this respect for a pilot's license. The start was made in a strong wind which continued throughout the trip. Taking the times noted by observers at various villages, the balloon was travelling 40 miles in 50 minutes during part of the journey. The clouds hung low and the balloon disappeared as it cleared Hoosac Mt. The landing was beautifully made at the exact spot picked out some distance ahead. A very heavy wind was blowing, which necessitated quick work with the rip cord.

Mar. 11.—A. Leo Stevens and William F. Whitehouse (A. C. A.) from Pittsfield in the "Stevens 21" at 11:07, landing near Hampton Beach, N. H., at 2:00 p. m., a distance of about 130 miles air line. Based on this distance, the mean speed by air line would be 45 miles per hour. There was little wind on the ground at the start, but increased rapidly until it was found to be strongest at an altitude of 2,000 feet. The notes of Mr. Whitehouse read: "Pittsfield 11:07, Shelburne Falls 12:00, Turners Falls 12:10; cross Connecticut River 12:15, South Royalston 12:42; crossed Merrimac River at Nashua 1:20, Haverhill 1:45, Hampton Falls 2:00. Landed in a tree with the car about 90 feet from the ground. The tree was about a mile from the sea. It was never cold, except, before the start at Pittsfield, there was a small but driving sleet storm."



In checking up the distances on a large scale road map they are found to be as noted on the diagram. Using the time table given by Mr. Whitehouse most surprising speeds result. Even allowing for small inaccuracies in measuring and the indefinite exact spot of landing, which has been ascertained within about half a mile, the mean speed by path, 49 m.p.h. (adding together the speeds between points and dividing), is indeed curious from a meteorological standpoint.

The records of the Concord, N. H., Weather Bureau, show "that the wind blew about 2 m.p.h. till noon; after which time it began to increase, averaging about 12

m.p.h. until 8 p. m., and reaching a maximum velocity of 22 miles from the southwest at 5:17 p. m. Low currents were from a northeasterly direction in the forenoon and southwest to west in the afternoon."

A postal card was dropped at Haverhill and was returned with the following notations—evidently the finder looked up his map:

"Haverhill, Mar. 11, 1908.

"Yours just received, at 1:50 p. m. Wish you good luck. Think you are going to Hampton Beach, where we spend our Summers. If you come our way drop down to see us.

Respectfully,

"C. R. Newcomb, 776 Main St."

There can be no doubt of the approximate times as noted by Mr. Whitehouse and the only error is in the mileage. We do not know of any case in which the speed between Haverhill and the landing place has been exceeded. The total distance by path is 131 miles. Mr. Stevens stated that the drag rope at times hung almost horizontal with the car.

Mar. 20.—A. Holland Forbes (A. C. A.) and N. H. Arnold (N. A. A. C.) in the "North Adams 1" (35,000 cu. ft.) from North Adams at 11:02 a. m., landing in Wilbraham, Mass., at 1:30 p. m., a distance of 55 miles. The highest altitude was 7,800 feet. This makes five trips for Mr. Forbes and two for Mr. Arnold. It was also the initial trip of the "North Adams 1," formerly the "Stevens 21." It is interesting to note that out of the five ascensions made by Mr. Forbes from North Adams, three landings were made within a few miles of the same spot, Palmer, Mass.

Mar. 25.—Second ascension under the auspices of the N. A. A. C. A. Holland Forbes (A. C. A.), A. W. Chippendale and N. H. Arnold (N. A. A. C.) in the "North Adams 1" from North Adams at 10:20 a. m., landing in Chesterfield, Mass., about 12 miles northwest of Northampton, at 11:45 a. m. Distance, 27 miles. This was Mr. Chippendale's initial flight. Highest elevation, 6,500 feet.

Mar. 31.—A. Holland Forbes (A. C. A.), N. H. Arnold and Roswell Gardner (N. A. A. C.) in the "North Adams 1" from North Adams at 9:25 a. m., landing at Chester, Vt., at 11:50, a distance of 46 miles.

ON THE USE OF LIQUID HYDROGEN AND HYDROGEN-CONTAINING COMPOUNDS IN LONG DISTANCE BALLOON FLIGHTS.

In Three Parts—Part II.

By Darwin Lyon.

The first instalment, published in the March issue, dealt with the various hydrogen compounds and considered the adaptations of such compounds to an aeronautic use.

For the benefit of those who are unacquainted with the difficulties met with when we attempt to preserve in the liquid state a fluid with a boiling point of minus 253 deg. Centigrade,* considerable must be said: we will also touch upon the various kinds of flasks and receptacles used for holding such a fluid. Incidentally, a few things will be said concerning its nature, properties and production.

Liquid hydrogen is simply hydrogen so cold that it has assumed the liquid state. Matter is usually considered as existing in three forms: the solid, the liquid and the gaseous. Many authorities state that there is a fourth state—the ultra-gaseous or radiant state—and some physicists say that matter in the crystalline form should be considered as a separate "state" of matter.

This is rather off the topic in hand, and I state it merely because so many people entertain an erroneous conception as regards the true nature of a gas in the liquid condition. They either think it a certain "preparation" of the gas or a "solution" of the gas in water. It is because of a want of a correct understanding of such things as these that there so often results an obscurity of ideas bordering upon complete bewilderment.

This want of a correct understanding concerning the true nature of matter is generally accompanied by ideas that are not only untrue, but that lead to a confusion and complication of things otherwise simple. Thus, moist air is considered by most people

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* Authorities differ greatly on the boiling point of hydrogen: some stating it to be as high as minus 238 deg. C. (—396 deg. F.), while others state it as low as minus 253 deg. C. (—423 deg. F.). The latter is now considered to be correct, although it is one degree lower than that observed by Dewar in 1899, using a hydrogen thermometer under reduced pressure and held as accurate.

to be heavier than dry air—considered to be heavier for much the same reason that they consider a wet sponge to be heavier than a dry one. They compare a saturated atmosphere with a saturated sponge. Not only is their comparison wrong—and thus their reasoning—but they are wrong as a matter of fact. Damp air is lighter than dry air, for damp air contains water not in the state of "water," but as gaseous water or "steam," and the specific gravity of water in the gaseous condition is much less than that of air. Thus it is that a balloon rises better on a dry day than on a damp one, for, to say nothing of the bag and cordage being dry, the air itself is heavier. For similar reasons, a balloon rises easier on a cold day than on a warm one. * * * *

The reduction of a gas to the liquid state is, with few exceptions, accompanied by a reduction of volume. A cubic foot of steam condenses to a cubic inch of water—or, in other words—a cubic inch of water will give a cubic foot of steam. A cubic inch of liquid air will give 800 cubic inches of air at ordinary temperatures. At the sea-level with a temperature of 27 deg. C. (80 deg. F.) a cubic inch of liquid hydrogen will give nearly 900 cubic inches of hydrogen gas.

Now the volume of a gas varies with the temperature. When the temperature is raised one degree Centigrade, the volume of the gas is increased 1/273 part of the volume occupied at O deg. If, therefore, the volume of a gas at O deg. C. is V, at t deg. its volume v will be

$$V + \frac{t}{273} V, \text{ of } v = V + \frac{t}{273} \cdot V, \text{ of } v = V\left(1 + \frac{t}{273}\right)$$

The volume of a gas also varies according to the pressure.

When the pressure is doubled the volume is decreased to one-half; and when the pressure is decreased to one-half the volume is doubled. Increase the pressure two, three or four times and the volume becomes one-half, one-third or one-fourth, and vice versa. In other words, the volume of a gas varies inversely as the pressure.

If at the pressure P the gas has the volume V, and at the pressure p the volume v, we see that our formula for pressure will be

$$PV = pv$$

Experiment proves that this law holds true for gases not too near their point of condensation. But as far as the aeronaut is concerned the law is exact: for, though it is only with those gases that under severe pressure become liquefied that departures in the law occur, the departure is only apparent when near the point of liquefaction.*

By reading the barometer and thermometer, and using the two formulae given above, the aeronaut can always tell the exact volume of hydrogen gas that will be given off by, say, a cubic inch of liquid hydrogen. The ratio of liquid hydrogen and gaseous hydrogen under standard conditions of temperature and pressure is about 1:820. Suppose we wish to measure the volume of gas that will be given off by a cubic inch of liquid hydrogen at the sea level at a temperature of 20 deg. C. (68 deg. F.).

Using the formula: $v = V\left(1 + \frac{t}{273}\right)$, we proceed thus:

$$v = V\left(1 + \frac{t}{273}\right)$$

$$v = 820\left(1 + \frac{20}{273}\right)$$

$$v = 880$$

At the sea-level the atmosphere exerts a pressure equal to that of a column of mercury 30 inches high; or, in other words, equal to 14.7 pounds per square inch. At a temperature of 20 deg. C. and with the barometer reading 30 inches, we have figured that a cubic inch of liquid hydrogen would yield 880 cubic inches of gas. We have already seen that the volume of a gas varies inversely as the pressure. Thus, at a height of 19,500 feet, the aeronaut would get 1,760 cubic inches of gas from each cubic inch of hydrogen, for at this height the pressure of the atmosphere is just one-half of what it is at the sea-level, the barometer reading only 15 inches. Taking both temperature and pressure into consideration, the most convenient ratio for the aeronaut to use in computing the amount of gas he is going to obtain from his liquid hydrogen, would be 1:1000.

When the aeronaut has ascended to a height of 19,500 feet, or a little less than 3¾ miles, he may assume that he has lost one-half of the gas with which he started. As a matter of fact, the pressure at a height of 19,500 feet is generally more or less than one-half, for the pressure of the atmosphere varies somewhat from day to day, from

* The departure from the law is wider the more nearly the point of liquefaction is approached, the diminution of volume then being more than proportionate to the increase in pressure.

hour to hour, and with latitude and longitude, but for our purposes it is near enough.

If the atmosphere were everywhere of the same density we would have no difficulty in calculating its height. We would only have to divide the pressure upon one square inch of the earth's surface by the weight of a cubic inch of air, and the quotient would be the height of the atmosphere in inches. Thus a cubic inch of air at 0 deg. C. at a pressure of 14.7 pounds (235.8 ounces) to the square inch, weighs 0.000749 of an ounce. Dividing 235.8 by 0.000749 we get 314,000, which (were our atmosphere homogenous and of uniform density) would be the height of the atmosphere in inches—314,000 inches or 4.97 miles. If we turn from this problem to the more important and difficult one of finding the height to which the atmosphere really does extend, we find that no such definite and satisfactory results can be given. We know that at a height of 5 miles, the atmosphere is so attenuated that it barely supports human life; and that at 6 miles it will not support life. We know from the phenomena of twilight that at a height greater than 45 miles it is too attenuated to reflect the light of the sun; but from the combustion of shooting stars we know that an appreciable atmosphere exists as high as 200 miles. As we ascend the strata become rarer and rarer, for the reason that the lower layers are weighed down and compressed by those above, and at increasing heights there is less and less air above to exert this compression. Thus the further we go the more and more attenuated the atmosphere becomes, until at last, by insensible gradations, we reach a perfect vacuum. In the famous balloon ascension of Glaisher and Coxwell, on Sept. 5, 1862, these gentlemen attained a height of almost 5½ miles—a point at which the barometer reads only 9½ inches.

We computed above that at 20 deg. C. and at a height of 3¾ miles, a cubic inch of liquid hydrogen would yield 1760 cubic inches of gas. At the height attained by Glaisher and Coxwell this would have increased to 2589 cubic inches.

With the exception of helium, hydrogen is the most difficult of all the gases to liquefy, and was the last to withstand the efforts of James Dewar. Its liquefaction in bulk was unknown ten years ago, and hence our rather incomplete data concerning it. In 1891 Professor Ramsay wrote as follows: "It [hydrogen] has never been condensed to the solid or liquid state. Cailletet, and also Pictet, who claim to have condensed it by cooling it to a very low temperature and at the same time strongly compressing it, had in their hands impure gas. Its critical temperature, above which it cannot appear as a liquid, is probably not above minus 230 deg."

One of the advantages in the use of liquid hydrogen to the aeronaut is that the gas given off is pure hydrogen—an article almost unknown to balloonists, though many appreciate its value. For it should be borne in mind that air is 14½ times as heavy as hydrogen, and therefore at this rate 7 per cent. of air by volume in hydrogen, means 51.4 per cent. by weight of the mixed gases—over 50 per cent.!

Hydrogen cooled to minus 195 deg. (78 deg. absolute temp.) is still at a temperature that is just twice its critical temperature (—234 deg. or 39 deg. absolute), using the "absolute" degree as a unit. Minus 195 deg. is approximately the boiling point of nitrogen, the boiling point of air being a degree or two higher. The direct liquefaction of hydrogen at minus 195 deg. would be comparable to liquefying air at a temperature of 59 deg.—obviously impossible. In other words, it is more difficult to liquefy hydrogen at the temperature of boiling air, than it is to liquefy air at ordinary temperatures. However, these difficulties have been overcome and liquid hydrogen can now be made in bulk almost as easily as was liquid air twenty years ago. Its production in bulk, though still expensive, has of late been greatly reduced. With the apparatus and methods in use five years ago, it is doubtful if it could have been made at any price in quantities larger than a litre. The amount of hydrogen gas allowed to escape in the cooling process was enormous, sometimes running as high as 20 cubic feet per minute. The liquefying apparatus used by Dewar at the Royal Institute allowed hydrogen to escape continuously from the nozzle of the coil pipe at the rate of 12 cubic feet a minute. With the improved apparatus now in use liquid gases can be made both cheaper and easier. The liquid air plant at Washington, D. C., is one of the finest in the country. The apparatus is not modeled after the designs of M. Pictet or of M. Cailletet, but was worked out by the makers themselves. The hydrogen circuit is quite distinct from the air circuit. The actual electrical power input to drive shafting, compressors, etc., in making liquid hydrogen with the apparatus in use at Washington is approximately eight kilowatts. In addition, a quantity of liquid air is consumed as a precooling agent, and in making a short run this quantity varies through a comparatively wide range, according to the conditions of starting, stopping, etc. I have no very good data on which to base an estimate, but think it would be safe to say that not less than ten liters of liquid air are expended in producing one liter of hydrogen. With certain modifications of the apparatus the amount of liquid air used could probably be greatly reduced. The plant at Washington produces the liquid hydrogen at the rate of little over a liter an hour. Specifications are now being made for a plant to be in-

stalled in one of our larger universities that, it is claimed, will be able to produce liquid hydrogen at the rate of two or three liters per hour, and at a cost of not more than two dollars per liter when large quantities are to be made and when a chemically pure product is not required. Even with the modifications now in view of the plant at Washington the price per liter would be considerably more than that stated above—just how much I have been unable to determine. It is safe to say, however, that were there a sufficient demand, 140 liters, or 5 cu. ft. (enough to produce 5000 cubic feet of hydrogen gas) could be made for two or three hundred dollars. * * *

If a few drops of water are put in a clean, smooth spoon that has been heated in the fire, they will gather into a globule which will dart around over the spoon's surface. The water has assumed what is known as the "spheroidal state" and is at a temperature below its boiling point. The globule rests upon a cushion of steam, which prevents it from coming into direct contact with the metal. A liquid so situated that it could touch no other liquid or solid would assume the "spheroidal" state. The importance of the spheroidal state with reference to the liquefaction of gases can hardly be overestimated. But for the spheroidal state not only would it be next to impossible to manipulate liquid gases as we now do, but the dangers in such manipulation would be increased a hundred fold. However, owing to the fact that liquid gases do assume the spheroidal state, we are able to handle them in much the same fashion as we do water, although theoretically it is the same as though we kept the water in red hot vessels. This, as can be proven by experiment, can easily be done, but it is still easier to keep liquid air or hydrogen in vessels at room temperature, for the reason that such a temperature is, as compared with liquid air, "more than red hot," and they are maintained at this "red hot" temperature without having to depend on artificial heat.

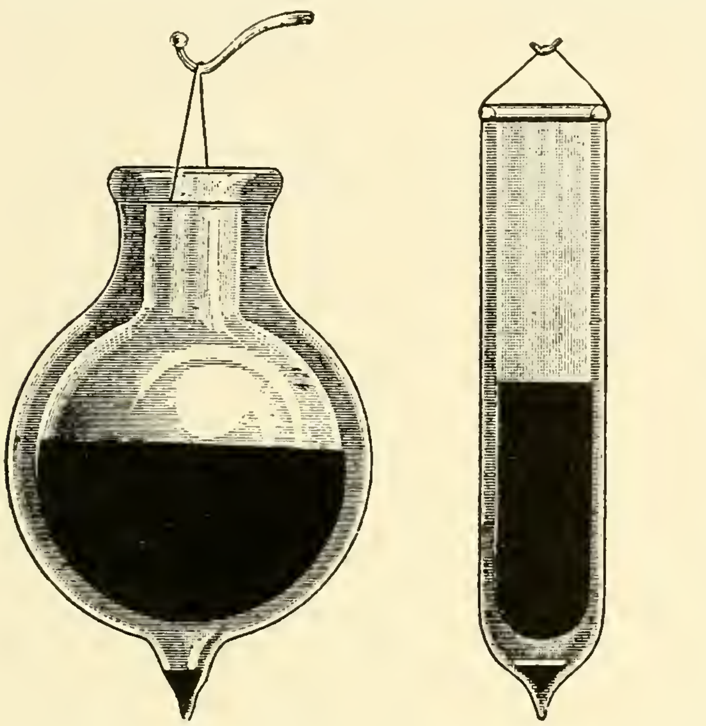
Thanks to the "spheroidal state," if liquid hydrogen is accidentally spilled on the hand no injury results. In fact, the hand may be immersed in it with safety, for the heat of the hand causes an extremely thin layer of gas to be formed between the surface of the skin and the liquid hydrogen. Thus this layer of gas keeps the liquid gas from coming in direct contact with the skin and protects it for a short time. Should good contact take place, as may happen if the hand is very dry and chapped, the result is a severe sore similar in nature to a burn.

The reason liquid air does not immediately "flash into air" when poured into a tin cup is again because of this protecting cushion. If left in the open air in ordinary vessels, liquid gases evaporate rapidly—for our purpose altogether too rapidly. The reason liquefied gases volatilise and disappear is that they receive heat from surrounding matter—from the containing vessel, and from the atmosphere.

Early in his scientific work Dewar recognized that it might be possible to make this loss considerably less by utilizing a vacuum as a non-conductor of heat, and that in handling liquid gases the greatest desideratum would be some kind of a vessel that would hold them without the rapid absorption of heat experienced under ordinary conditions. After much labor and many failures he devised the vessel bearing his name. The Dewar vacuum flask, or "Dewar-bulb," as it is more commonly known, consists, in its simplest form, of an inner flask sealed into the neck of a larger one. The space between the two flasks is made as perfect a vacuum as possible. A triple walled flask is still better, as this gives two vacuum spaces. The only ways by which the liquid hydrogen contained in the inner flask can gain heat are, by conduction through the glass where the vessels are joined, and by direct radiation. The first is small; for the walls of the vessels are thin and glass is a poor conductor of heat. The liquid receives practically no heat by conduction from the air above it, for it is protected by a layer or "pad" or gas almost as cold as the liquid itself. The greater part of the heat that is received is imparted by the ether waves as radiant heat. This is further reduced by the device of placing in the vacuum space a small amount of mercury: in the vacuum, this mercury evaporates, and when the flask is filled, the mercury vapor condenses and freezes upon the outer wall of the inner flask. There is thus formed a very perfect mirror which reflects the greater part of the radiant heat striking it. By all these devices the liquid hydrogen is so protected from its heated environment that its boiling is scarcely perceptible: in fact, but for the loss by evaporation, we would not know that it was boiling.

The more perfect the vacuum, the less the heat conducted. A good exhaustion cuts off four-fifths of the heat that would be conveyed were the space filled with air. The mercury mirror reduces the influx of heat to one-sixth of the amount entering without the metallic mirror. With the most perfect flasks obtainable the total effect of vacuum and mirror is to reduce the ingoing heat to one-fortieth part. It has sometimes been said that the metallic mirror does but little or no good, for the reason that all kinds and forms of matter become transparent to radiant heat at low temperatures, but experiments have proven that this assumption is unwarranted. In a vessel con-

structed with three separate vacuum spaces 60 per cent. of the influx heat is cut off, as against 96 per cent. in a single walled but silvered vessel. For some reason, vacuum vessels deteriorate—just why we have been unable to discover, but it is certain that many of those on the market are next to worthless. In this country probably the best obtainable are those sold by Eimer & Amend, New York. However, for our purposes, no bulb yet made would suffice, and one much larger than any now in existence, would have to be made to order. In fact, even if only 19 or 20 liters of liquid hydrogen were to be carried, the bulb, if only one were used, would have to be so large that it is a question as to whether the vacuum flask would, for our purposes, be after all the best; and whether the light tin buckets, to be described later, would not be better. For, as can be seen by the diagram, the inner flask of a triple walled Dewar-bulb is very small as compared with the size of the outermost flask; so that the size of a triple walled Dewar bulb capable of holding 5 gallons (approximately 19 liters) would be very large, to say nothing of its weight and cost. A triple walled Dewar-bulb capable of holding one gallon weighs about 2½ pounds. The sheet-iron case, lined with felt, used for holding the bulb and protecting it during transportation, weighs about 15 pounds. For our purpose one of about one-fourth this weight would suffice. But even supposing that the entire receptacle weighed only seven pounds, this seems too great a weight for the carrying of only one-half a pound of liquid hydrogen, for this would mean the carrying of a weight of 6 pounds for each one-half pound (one gallon) of liquid hydrogen. One-half pound and one gallon! The reader may wonder at the comparison, for at first thought it seems scarcely possible that one gallon of a liquid can weigh only one-half a pound. But this seeming discrepancy is cleared up when we state that the specific gravity of liquid hydrogen is only 0.07, only one-fourteenth that of water. This brings us to another important question—Irrespective of the nature of the container, how shall we carry, fix and support this container?*



As before said, it is only of late that we have been able to manufacture liquid hydrogen in bulk. To calculate its rate of evaporation by comparison with liquid air (though theoretically possible) is difficult, for many things have to be taken into consideration, and at present it is impossible to make any definite statement except as a result of observation on the particular container in question.† Even then a great difference is found depending upon the method used to reduce the convection currents in the gas above the liquid. With the Dewar bulb something depends (for hydrogen we cannot yet say exactly how much) on the degree of exhaustion of the bulb and the perfection of the silvering. A great deal more depends on the shape and size of the flask, since, as before said, with a good vacuum and small convection, the chief source of heat is by conduction through the inner glass wall. This will obviously be smaller when the flask is not agitated and when the neck is kept as cold as possible by the gas that escapes.

(To be continued.)

* This question with a more detailed description of the tin buckets used by Tripler for transporting liquid air, the various kinds of wrappings used, and a comparison of the Tripler buckets with the Dewar bulbs will be treated by Mr. Lyon in the May number.—Ed.

† This will be more fully discussed in the May number.

A Park of Sports at Brussels.

There has just been formed a company having a capitalization of 125,000 francs for the purpose of conducting a sporting park in that city. It is expected that aerial contests will be among those held.

North Adams Aero Club.

At a meeting held on March 9th, the North Adams Aero Club was duly organized with Colonel Frank S. Richardson, President; John H. Waterhouse, Vice President; Arthur W. Chippendale, Treasurer and N. H. Arnold, Secretary. The Executive Committee is composed of Messrs. George A. Macdonald, Roswell A. Gardner and W. H. Pritchard. The other charter members are: Arthur D Potter of Greenfield; E. C. Peebles, R. J. Stratton, Dr. R. D. Randall, I. D. Curtiss, J. D. Hunter, Archer H. Barber, Harry Hewat, Hugh P. Drysdale, all of North Adams; A. Holland Forbes and Aeronaut Leo Stevens, of New York.

The new club has purchased the "Stevens 21," which will be known hereafter as the "North Adams No. 1," and will rent the balloon to its members and supply a qualified pilot at a nominal rate. With the two old balloons of the Aero Club of America out of commission, this will be the only club in this country maintaining a balloon for the use of its members—a great credit to the enterprise of North Adams, but rather the opposite for America in general.

The Berkshire Club gave a "balloon smoker" in the club rooms Thursday evening, March 19, to members of the North Adams Aero Club and invited guests, who included 20 members of the Massachusetts Legislature, who were in the city, having come a day earlier in order to attend the smoker and ascension, than was their intention.

About 200 in all were present, and President A. H. Barber of the Berkshire Club, and also a charter member of the North Adams Aero Club, presided. The speakers included President Frank S. Richardson of the Aero Club; Mr. A. Holland Forbes of the Aero Club of America and the North Adams Aero Club, who piloted the first trip of the "North Adams No. 1" the following morning; President Luke J. Minahan of the Aero Club of Pittsfield; Superintendent E. C. Peebles of the North Adams Gas Light Company, and who is responsible for the excellent quality of gas provided for ballooning purposes at North Adams and is a charter member of the Aero Club; Senator C. Q. Richmond of North Adams; Senator Grimes of Reading and N. H. Arnold, Secretary of the North Adams Aero Club, who was Mr. Forbes' companion on the first trip of the balloon. The aneroid barometer and statoscope were explained and exhibited by Mr. Forbes in the course of his talk to the audience. During the evening substantial refreshments were served.

On Friday morning, March 20, after the balloon had been inflated and was ready for flight, it was christened by Miss Elizabeth B. Chippendale, daughter of Treasurer A. W. Chippendale of the Aero Club, who broke a bottle of champagne on the anchor. A crowd estimated at over 3,000 and including many from other towns and cities, was present.

The start was made at 11.02 to the accompaniment of the shrieking of mill and factory whistles and the cheers of the crowd. The balloon traveled slowly first to the south and then to the southeast, attaining a height of 5500 feet in 15 minutes. The winds were light and variable, and the sun and clouds bothered a good deal, so that finally after having crossed the Connecticut River at a height of 6400 feet and ascended soon after to 7800, the highest mark, it was decided to descend. The landing was perfect, on property of Mr. Seymour Holland in Wilbraham at 1.30, about two and one-half hours after the start. Distance traveled, about 60 miles. Owing to the stiff ground breeze it was necessary to use the rip cord to prevent damage to the balloon after effecting the landing.

Mr. Arnold proposes to qualify at once as a balloon pilot. He has already made two ascensions.

Aero Club of Ohio.

The A. C. O. seems to be in difficulty. The club is trying to secure McKinley Park for an ascension ground, but President Sherrick wishes nine trees cut down, and serious objection was made to this by the authorities. According to the Canton News the President said:

"If the Aero Club cannot secure the McKinley Park grounds for the purpose of making that the starting place for the ascensions, I will give up the enterprise. We will not use the park unless the nine trees that make the ascensions dangerous are removed. The trees that must be cut down are full of snags, with the exception of two near the center of the park, which are good trees. The others would make the sport too dangerous and the club would not authorize nor permit any trips unless they are out of the way. It would be too bad if the enterprise would have to be dropped on account of the threatened injunction. We would bring thousands of people to Canton by having the ascensions. Supposing we would advertise a balloon ascension for Saturday afternoon. People would come to this city from all directions

on the steam and electric roads to witness it. In that way the merchants would be benefited and the city would be in the public eye all season. We must not give up the sport under any consideration, as it means too much for the city."

Milwaukee Aero Club.

At a meeting of the charter members of the Milwaukee Aero Club, held March 16th, at the offices of the Merchants & Manufacturers' Association, the following officers were elected: Directors—Wm. Woods Plankinton, John H. Moss, J. H. Kopmeier, Wm. Geo. Bruce, R. B. Watrous, A. O. Smith, Major Henry B. Hersey, Sheldon J. Glass, E. P. Vilas.

The following named gentlemen were elected officers to serve one year as follows: President, John H. Moss; First Vice-President, J. H. Kopmeier; Second Vice-President, Commodore Vilas; Secretary, R. B. Watrous; Treasurer, Oliver Clyde Fuller; Consulting Engineer and Assistant Secretary, Dr. A. Rudolph Silverston.

The following named gentlemen comprise the charter members: W. H. Whiteside, President Allis-Chalmers Co.; John I. Beggs, President The Milwaukee Electric Railway & Light Co. and President of the St. Louis Street Car Co.; Col. Gustave Pabst, President Pabst Brewing Co.; Oliver Clyde Fuller, President Wisconsin Trust Co.; E. P. Vilas, Commodore Milwaukee Yacht Club; Sheldon J. Glass, President and Manager Milwaukee Gas Light Co.; Wm. Woods Plankinton, Capitalist; John H. Kopmeier, President Wisconsin Lakes Ice Co. and President Citizens' Business League; John H. Moss, President Rockwell Manufacturing Co. and President Merchants & Manufacturers' Association; A. O. Smith, President A. O. Smith Manufacturing Co.; Major Henry B. Hersey, Inspector United States Weather Bureau; Dr. Louis Fuldner, President Milwaukee Automobile Club; Wm. Geo. Bruce, Secretary Merchants & Manufacturers' Association; R. B. Watrous, Secretary Citizens' Business League; Chas. F. Pfister, Capitalist; Dr. A. Rudolph Silverston; the best men of the State, all enthusiastic sportsmen, and willing to give their time and energetic attention to the affairs of the club.

Aero Club of the United Kingdom.

The English club has made an arrangement with the Hurlingham Club by which a 12-inch pipe will deliver to the grounds 100,000 cubic feet per hour of pure coal gas.

Aero Club of St. Louis.

An aeronautic "carnival" is planned for October. A. B. Lambert, a member of the committee on arrangements, is now abroad, and while no report has been rendered the directors, a national or an international balloon race will be one of the features. There will be also, it is expected, a contest for dirigibles. Perhaps we can have aeroplane races by that time!

New Aero Clubs.

It is reported that the Philadelphia Aeronautical Recreation Society is being formed, and that Samuel A. King is making a 50,000-cubic foot balloon for the society. "The new society will be composed entirely of amateurs and its sole object will be aerial recreation. It is not meant to be a society for the study of the subject of aeronautics or advancement of science, but a social organization entirely. Its organizers are Dr. Thomas E. Eldridge and Dr. George H. Simmerman, both members of the Ben Franklin Aeronautical Society of the United States and the Balloon Association. Women will be admitted to membership, and before long it is expected that a club house will be purchased."

The Aero Club of Frankfort has been formed and has ordered a 2200 c. b. m. balloon. It already owns the "Ziegler" for the scientific ascensions of the Physikalischer Verein.

The Aero Club de l'Ouest has been formed at Angers. The club already possesses a balloon, l'Ouest, of 800 cubic metres' capacity, built by M. Emile Carton, which recently made its first trip, starting from the enclosure of the present association of the Aéro Club de France at Saint-Cloud. The club has leased an enclosure near the Angers gas works, and arrangements will be made for the prompt inflation of balloons. M. René Gasnier, who was one of the French competitors at St. Louis, who resides close to Angers, has also promised to give the new club his support and help.

An Aeronautic Section of the Automobile Club of Milan has been formed. Among the members are Engineer Forlalili, Captain Frassinetti, Messrs. Usuelli and Crespi, the renowned Italian aeronauts.

Balloon Farm Notes.

Prof. Carl E. Myers, of the "Balloon Farm," Frankfort, N. Y., announces "that he is constructing for western parties the largest airship yet built by himself or any one else in this country. It is of his well-known spindle shape, and has a circumference and length of 84 feet, and a buoyancy of 1700 pounds. This will be finished in two weeks, when he will begin the construction of a still larger airship on the lines of the Government specifications, but twice the dimensions of the late accepted bid. Within the past five days he has wholly constructed two captive hydrogen gas balloons and nets for the United States Government. This speed is only made possible by use of ready machine-varnished hydrogen proof fabrics originated by him and in use exclusively during thirty years, and from which he has already built 150 hydrogen balloons for the War and Weather Departments of the United States. Ordinarily by the usual systems it requires from thirty to sixty days to completely varnish a hydrogen tight balloon."

France and Her Experimental Field.

The Minister of War has given the Aero Club of France the use of a large field adjoining Issy les Moulineaux. Space will be provided for those aviators who will build garages for their apparatus. The field will be surrounded by a fence and properly policed, so that experimentors can make flights at any time whenever the soldiers are not using the field. Bleriot, Farman and Voisin have already applied for their spaces.

Spa Aviation.

The prizes have been announced for the aviation contests of the Aero Club de Belgique at Spa, July 12, 19 and 26. $11,100 will be distributed in prizes during the three days: $2400 as first prize the first day, $3000 the second day, and $4000 the third day. Second prizes of $300 each will be distributed on the three days. On the 12th and 19th there will be duration contests, with two prizes of $600 and $200 respectively. In addition to these, an indemnity of $100 will be granted to all competitors not winning prizes, providing that they compete on all three days and make in one of these three at least 100 metres from the point of departure or that their home club, if affiliated, will certify that flights of that length have been made by them.

The competitions are open to any type of aeronefs. The entrance fee is 80 cents for each horsepower. In the contest for duration the one who stays in the air the longest time wins, and an indemnity of $40 will be allowed to any competitor who stays in the air 5 minutes or whose club will certify that he has done so at some other place.

The Aeroplane Ellehammer.

The aeroplane of the Danish experimentor, Herr Ellehammer, has made two hundred flights, of which the best was that on February 13th, 1908, when he achieved a flight of 300 meters. The machine has gone through three forms; monoplane, biplane and triplane. As noted in the July, 1907, issue of AERONAUTICS, with a biplane machine of the "Wright type" he made a flight in January, 1906, of 162 feet against the wind. The motor was then stopped and an easy descent made. On January 14th, 1908, he progressed to 175 meters at a height of 5 meters from the ground, with remarkable steadiness. The confined space did not admit of a longer flight. He has been practicing curves and has succeeded in executing an "S" at a speed of 11 meters a second.

Cost of British Military Airships.

According to figures taken from the English Army statistics for 1906-7 the expenditures on "Nulli Secundus" up to March 31, 1907, were, roughly, $33,395. $45,000 represents the "value of articles manufactured and services performed at the balloon factory;" and the United States Government is spending what?

The International School of Aeronautics has removed to 2 East 29th Street, directly opposite the "Little Church Around the Corner." Two entire floors are devoted to the school. Models of the "Ville de Paris" and the "Farman I," besides other valuable additions, are expected within the week. Weekly bulletins from abroad will be posted on the bulletin board. The students thus receive the latest detailed news items two weeks or more before it can be printed in the foreign journals and read here.

A TABLE FOR FINDING THE ASCENSIONAL FORCE OF GASES.

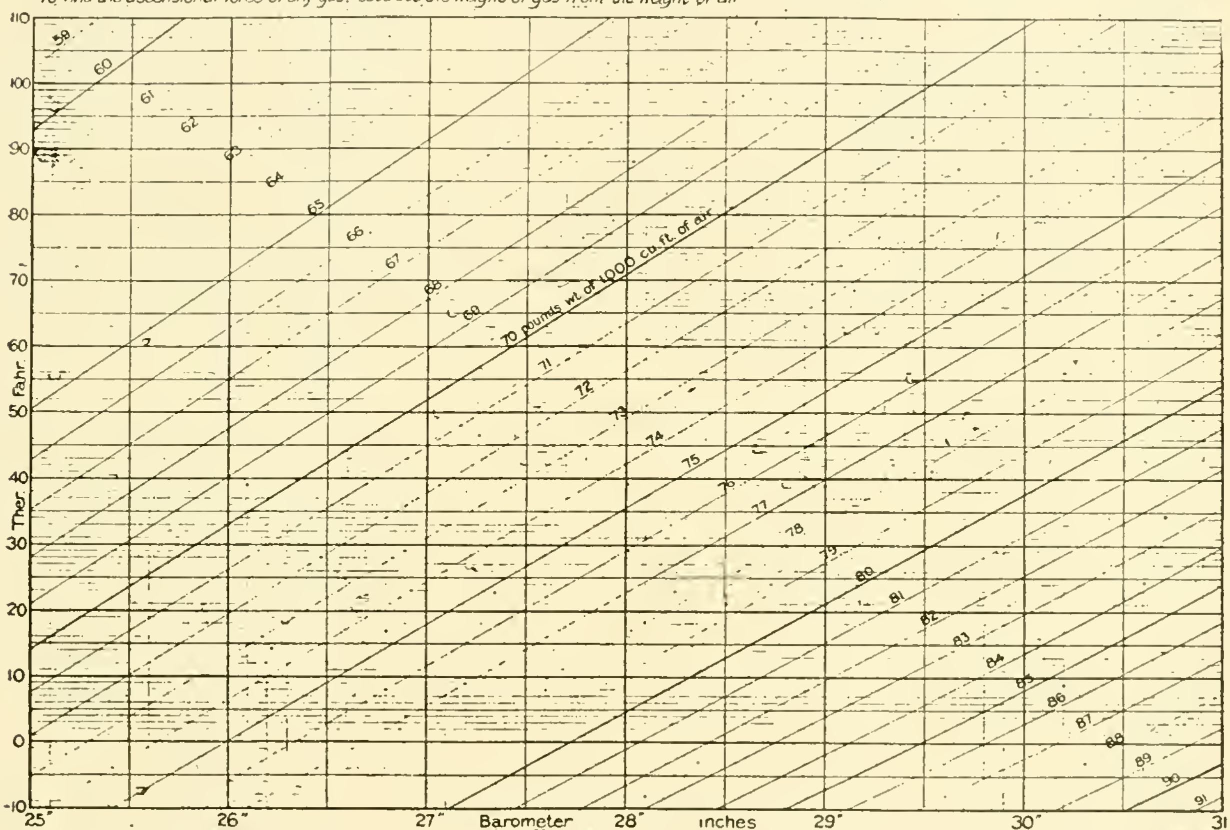
By Charles DeF. Chandler, Captain, Signal Corps, U. S. Army.

All persons interested in aerial navigation frequently have occasion to use in computations, figures showing the ascensional force of gases, and, in calculations for dynamic flying machines, it is necessary to know the weight of a certain volume of air. No accurate answer can be given to inquiries concerning the weight of air or the ascensional force of gases, without knowing the temperature and pressure of the atmosphere. A casual inspection of the table shown herewith illustrates the great difference in weight of equal volumes of air when there is a change, either in barometric pressure or temperature.

The weight of one thousand cubic feet of air can be found by an inspection of this table, without any computation, when the temperature in degrees Fahrenheit and barometer in inches of mercury are known, by simply following the horizontal line representing degrees Fahrenheit until it intersects the vertical line corresponding to the barometric reading. At the point of intersection of these two lines, note the figures indicated on the nearest diagonal line.

TABLE FOR FINDING THE ASCENSIONAL FORCE OF GASES.

The weight of air per 1000 cu ft at various temperatures and pressures may be found by inspection of this table.
To find the weight of an equal volume of any gas, multiply the weight of air by the specific gravity of the gas. Hydrogen spec. grav 0.0693 (pure).
To find the ascensional force of any gas, subtract the weight of gas from the weight of air



This table is sufficiently accurate for practical ballooning. For extreme accuracy, corrections must be applied for force of gravity at latitude and elevation, thermal expansion of brass scale and glass tube of thermometer and barometer and difference in coefficient of expansion of air and hydrogen.

The above is a practical example of finding the ascensional force of a gas having a specific gravity of .40, the barometer reading 30 inches and the thermometer 70 degrees Fahrenheit. By inspection of the table, the lines for 70 degrees Fahrenheit and 30 inches barometer intersect near the diagonal line marked 75. The figure 75 is the weight of 1,000 cubic feet of air. Multiply 75 by .4, which result is 30, the weight of 1,000 cubic feet of the gas. Subtracting 30 from 75 gives 45 pounds as the ascensional force per thousand cubic feet of the gas.

U. S. AERONAUTIC PATENTS, JULY TO DECEMBER, 1907.

Aerial navigator, F. M. Mahan, 861,133; aerial vessel, G. Halliday, 873,542; aerial machine, B. Connolly, 870,936; airship, L. Haines, 859,765; airship, C. McCormick, 864,672; airship, W. S. Miecarek, 865,415; airship, T. Cornbrodt, 866,665; airship, A. G. Russell, 867,083; airship, M. Schiavone, 868,223; airship, A. W. H. Griepe, 869,238;

airship, A. C. Ellsworth, 871,164; airship, G. W. Lane, 871,710; airship, Fadda & Di Lorenzo, 872,334; airship attachment, A. Mathews, 870,448; air motor, P. Kiefer, 868,868; air wheel, H. A. Lockwood, 864,317; balloon inflator, F. J. Creque, 874,166; balloon, car suspension for, A. von Parseval, 872,539; balloon captive, H. A. Herve, 870,430; flying machine, J. H. Wilson, 859,274; flying machine, W. H. Cook, 860,447; flying machine, F. M. La Penotiere, 861,740; flying machine, A. O'Brate, 867,525; flying machine, mechanism for, J. U. de Uherkocz, 868,038; flying machine, steering gear for, J. U. de Uherkocz, 868,039; flying machine, J. D. Pursell, 869,019; flying machine propeller, L. Gathmann, 871,926; kite, H. Lurz, 859,395.

McADAMITE: A NEW ALLOY HAVING NEARLY THE STRENGTH OF STEEL AND THE LIGHTNESS OF ALUMINUM.

A new aluminum alloy called McAdamite, which is now being manufactured by the United States McAdamite Metal Company, of Brooklyn, is a metal that should have a very wide application and be most useful in the flying machine industry. Most of the best alloys heretofore produced had only some 16,000 pounds compression strength, while McAdamite has 126,000 pounds per square inch. Where the elastic limit was extremely low, the new metal has more than most others, or 84,000 pounds before the yielding point is reached when under compression. Where the very best of the bronzes could barely claim 38,000 pounds per square inch torsional strength, this alloy has 60,000 pounds, or nearly as much as steel, which has 66,000 pounds.

In cast metals it is well known that the tensile strength is low, but even here this new metal is very strong, as it will stand nearly 45,000 pounds per square inch. The elastic limit or yield point of the cast alloy under a tension test is practically the same as the breaking point. A rod 5 inches long and 0.76 inch in diameter separated under a pulling strain of 20,000 pounds with an ultimate elongation of only 0.1 inch in 1 inch of length, or 10 per cent., and a reduction of area from 0.4525 per square inch to 0.442 per square inch, or 2½ per cent. The tensile strength of this piece figures out at 44,250 pounds per square inch, but the real tensile strength of the cast metal is probably somewhat greater, as the sample used had been turned down, thus removing the tough outer surface, which is the strongest part of all. This material, however, was sound and homogeneous throughout where the fracture occurred, which was at the centre of the rod.

The specific gravity of cast McAdamite is 3.20, as against 2.56 for aluminum and 2.89 for partinium. There is a shrinkage in casting it of 12 to 14 per cent. Its melting point is 977 deg. Fahr. as against 1,830 deg. Fahr. for brass; but, roughly speaking, it has nearly three times the strength in any direction, and three times the volume or one-third the weight of brass. Various degrees of strength and hardness are obtained by the mode of casting. So homogeneous is this metal and so free from gas that extremely intricate and delicate castings can be made. Very thin strips of the metal, when cast, are much stronger in proportion to their cross-sectional area than are pieces of larger size, as the rapid cooling and consequent hardening takes place from the surface inward, and are more complete with a thin piece than with a thick one.

When a piece of this new metal is broken, it shows a fine grain similar to steel; and if a bar of it be struck by a hammer, it will ring with a clear and resonant tone.

While heretofore it would have been out of the question to make long slender screws, for example, out of any of the aluminum alloys, with this new alloy it is quite possible and almost all of the moving parts of machinery, such as gears, levers, screws, cams, frames, etc., can be made from it. It can be machined with the greatest ease; the chips peel off in long curls, and fine screw threads are cut in it without the aid of oil, turpentine, etc. Although comparatively soft, it is an exceedingly tough metal, retaining all the beautiful qualities of aluminum and removing the weak ones. It gives to aluminum color, strength, tooling, density, fluidity; removes its dryness; and protects it from the attack of salt. It is the first commercially practical metal of great strength and little weight for common every-day use—a metal that may even partially displace cast iron as it grows cheaper, which it will do in time.

Among its many qualities is its freedom from occluded gases and viscousness, which gives it fluidity; and to-day gears and many things are being cast finished. The machine shop is no longer needed to cut the teeth in gears; they are cast cut, so to speak.

One of the heavy costs of work executed with the common metals is the finishing of the castings after they have been obtained. The surface must be removed by filing, grinding, turning, buffing, etc. With McAdamite only a slight buffing is needed at the most, for the pieces are cast with a bright, silver-white surface.

Its characteristics are similar to those of cast steel, and weight for weight it has equal strength in tension and greater in compression. In resisting tensile stresses, it

bears a very favorable comparison with the usual grades of mild steel even when equal volumes are compared. Thus it will be seen to have a great superiority in weight. Its toughness and elasticity are quite unusual for a cast metal, and it far outranks all metals classed as alloys in this respect. The fact that the elastic limit when under compression runs so high, gives it a wide application in the arts, and with its other qualities, puts it in a class by itself when compared with any other known alloy, its principal field being largely wherever brass and bronze are used and where extreme strength with minimum weight is required.

McAdamite has already been employed for aeronautical purposes and has been found most satisfactory.

AERONAUTIC CALENDAR

March.—Balloon race organized by the Aero Club of Nice. Distance race at Verona, Italy, on the 19th.

April.—Balloon race of the Aero Club of France on the 15th.

May.—Aero Club of France balloon race on the 16th. International balloon race of the Aero Club of the United Kingdom. International Aeronautic Congress of the F.A.I. at London, on the 30th. Distance balloon race at Barcelona, Spain, on the 17th; $2900 in prizes and gas free. Grand Prix of the Aero Club of France on the 24th. Aeronef contests at Munich.

June.—Aero Club of France balloon race on the 11th. Balloon race at Tours on the 21st.

July.—Balloon race at Brussels on the 19th. Flying machine contests at Spa, on the 12th, 19th and 26th.

September.—Grand Prix of the A. C. F. Aeroplane contests at Vichy.

October.—Distance contests and contests for prearranged objective point at Berlin on the 10th. Gordon Bennett International Race on the 11th. International aeroplane contests at Venice for $5000 in prizes.

1911.—International assembly of dirigibles in Italy under the auspices of the Societa Aeronautica Italiana.

COMMUNICATIONS.

National Airship Co.

To the Editor:

I notice a mention of the National Airship Company of San Francisco, in February AERONAUTICS under the head of "Notes."

Although I am not connected with the Company other than a small stockholder, I am anxious with other stockholders to see our Company a success. And such misleading articles tend to militate against the best interests of the Company.

Your correspondent states that all the officials connected with the concern have disappeared, and with them what is left of the stock sales, amounting to more than a quarter of a million dollars.

After I heard of the trouble I went over to San Francisco and found Mr. Morrell in the office working at a typewriter. He said he had been in the office every day, notwithstanding the report that he had absconded with the funds. He says he has paid out twenty-seven thousand dollars more than received for the sale of stock; never sold a share of personal stock and never accepted a dollar for personal services, and has worked more than fourteen hours per day during three years since the Company was organized. He says the Ariel will be built, if he is let alone, and do all that he has ever claimed for it. Where the malicious articles claim that the federal officers were asked to investigate on the complaint of hundreds of stockholders, Mr. Morrell says that only two stockholders have made any complaint, and these two are connected with other airship companies, and have an interest to down him.

I do not pretend to say how this trouble will come out. But there are certainly misstatements abroad concerning the Airship Company that should be corrected.

Very truly yours,

Berkeley, Cal., Feb. 28, 1908. W. S. HASKELL.

Russian Dirigible.

The Engineers' Corps have finished the project for constructing a dirigible like Patrie, capable of carrying five passengers. It will be built with Russian workmen and with Russian material. The motor is already completed. It will be ready in September.

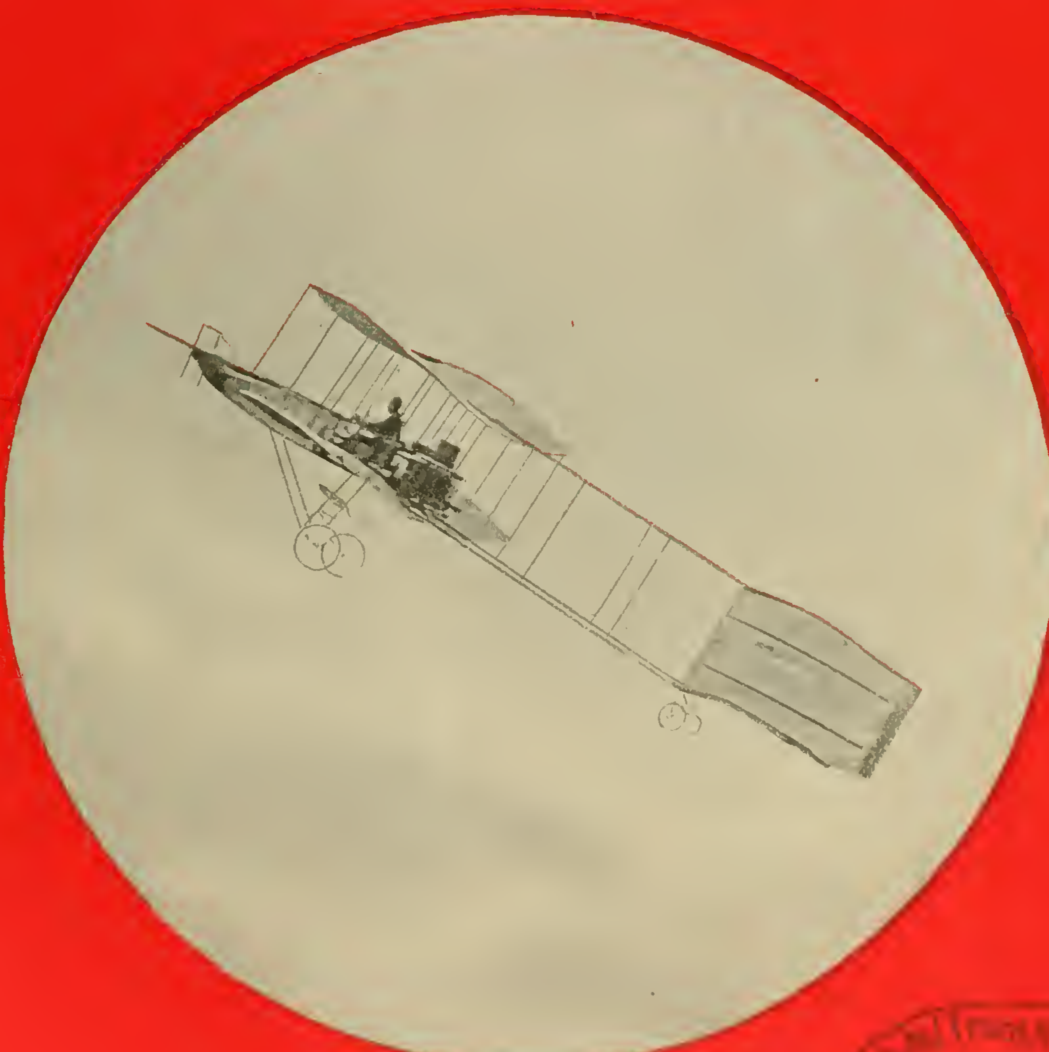
AERONAUTIC BOOKS FOR SALE.

This magazine will publish each month a list of such rare and contemporaneous books relating to aeronautics as it is able to secure. If you desire any of those listed, kindly send check with your order for the amount stated. Should the book ordered be sold previous to the receipt of your order, the money will be promptly returned.

History and Practice of Aeronautics (John Wise). Illustrated. 8vo., cloth, Phila., 1850. Very rare.......... 15.00
Travels in The Air (James Glaisher). Illustrated. 8vo., cloth, London, 1871...... 10.00
Flying and No Failure, or Aerial Transit Accomplished More than a Century Ago. (Rev. Ralph Morris). Very rare reprint on Private Press of London, 1751.. 3.00
My Airships (Santos Dumont). Illustrated. Crown 8vo., cloth.......... 1.40
Travels in Space (Valentine and Tomlinson). Introduction by Sir Hiram Maxim. 61 plates, 8vo., cloth, London. 1902.......... 2.00
Conquest of the Air (John Alexander). 12mo., cloth, London, 1902.......... 2.00
The Dominion of the Air (J. M. Bacon). Story of aerial navigation. Illustrated. Crown, 8vo., cloth, London, n. d.......... 2.50
Resistance of Air and the Question of Flying (Arnold Samuelson). Illustrated. 12mo., 42 pp., paper.......... .85
Flight Velocity (Arnold Samuelson). Illustrated. 45 pp., 12mo., paper.......... .85
Flying Machines, Past, Present and Future (A. W. Marshall and H. Greenly). Illustrated.......... .60
Paradoxes of Nature and Science (W. Hampson). Illustrated. Two chapters on balloons as airships and bird flight. 8vo., cloth, N. Y., 1907.......... 1.50
Aerial Navigation (Van Salberda). Translated from the Dutch by Geo. E. Waring, Jr. Illustrated.......... .60
By Land and Sky (J. M. Bacon). Illustrated. 8vo., cloth, London, 1900.......... 2.50
A Balloon Ascension at Midnight (G. E. Hall). Illustrated in color. Limited edition published. Very rare. 8vo., paper, San Francisco, 1902.......... 2.50
Andree's Balloon Expedition (Lachambre—Machuron). Illustrated. 12mo., cloth, New York, 1898.......... 1.00
Parakites (G. Woglom). Illustrated. 8vo., cloth, New York, 1896.......... .75
The Problem of Flight (Herbert Chatley, B. Sc.) A new textbook of aerial engineering both aerostation and aviation. Illustrated. 8vo., cloth, 1908.......... 3.50
Pocket Book of Aeronautics (Maj. H. W. L. Moedebeck). A manual of aviation and aerostation. Illustrated. Cloth, 496 pages, London, 1907.......... 3.25
Ballooning as a Sport (Maj. B. Baden Powell). Illustrated. London, 1907.......... 1.10
Navigating the Air (Members Aero Club of America). Illustrated. 8vo., cloth, New York, 1907.......... 1.65
L'Omnibus Aerien (Bourget). A musical piece sung by Mlle. Flore. Has a picture of flying omnibus on front. Is extremely rare. Paris, 1840.......... 7.00
Keely and His Discoveries, Aerial Navigation (Mrs. B. Moore). 8vo. cloth, London, 1893.......... 3.00
St. Louis Gordon Bennett race views in an album, full set.......... 3.00
Narrative of the Ascent and First Voyage of the Aerial Steamer (George Aire, F. A. S., A. L. C., etc.). Paper, 16 pp., ill., London, 1843. Rare.......... 2.50
Accounts of Three Aerial Voyages (Mr. Sadler). Small 8vo., boards, autograph of "Mr. Sadler," London, 1810-17. Very rare.......... 5.00
Aeronautical Annual (Edited by James Means). 8vo., cloth, ill., 176 pp., Boston, 1897.......... 1.75
Aeronautical Annual (Edited by James Means). 8vo., cloth, ill., 158 pp., Boston, 1896.......... 1.75
History & Practice of Aeronautics (John Wise). Illustrated, 8vo., cloth, 310 pp.. Phila., 1850.......... 9.00
Looking Forward; Aerial Navigation (Dr. A. De Bausset). Paper pamphlet, 48 pp., Boston, 1889.......... 1.50
Aerial Navigation (Arthur De Bausset, M. D.). Paper pamphlet, 48 pp., Chicago, 1887.......... 1.50
Sounding the Ocean of Air (A. Lawrence Rotch, S. B., A. M.). 12mo, cloth, ill., London, 1900.......... 1.00
Scientific Experiments in Balloons (James Glaisher, F. R. S.). A lecture before the Y. M. C. A., 1862-3. Cloth, 8vo., London, 1863.......... 3.00
Proceedings International Conference on Aerial Navigation, Chicago, 1893, cloth, 8vo., ill., New York, 1894.......... 4.50
Ballooning (G. May). Small 8vo., cloth, ill. Rare.......... 2.50
Account of the Late Aeronautical Expedition from London to Weilburg (Monck Mason). Paper pamphlet, 35 pp., N. Y., 1837.......... 3.50
Airships Past and Present, by Captain A. Hildebrandt; translated by W. H. Story (D. Van Nostrand Co., 33 Murray St., New York;).......... 3.50

AERONAUTICS

THE AMERICAN MAGAZINE OF AERIAL NAVIGATION



Delagrange in Flight

VOL. 2. MAY, 1908 No. 5.

PRICE, TWENTY-FIVE CENTS

BALLOON ASCENT OF A. HOLLAND FORBÈS AND N. H. ARNOLD AT NORTH ADAMS, MASS., 3 O'CLOCK IN THE MORNING.

AERONAUTICS

PUBLISHED MONTHLY BY

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ERNEST LARUE JONES, EDITOR AND OWNER

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ANNIVERSARY NUMBER

COMMEMORATING THE FIRST YEAR OF TRAVEL BY AIR

The age of aerial navigation is here. The year 1907–8 has seen numerous demonstrations of practical dynamic flight. The June number of AERONAUTICS will be its twelfth regular issue and it is but fitting that the only journal in America devoted to the art should celebrate the anniversary of its inception—coincident with the dawn of the new medium for travel.

It being safe to assume that the following year will be more prolific than the one just closing with this publication, everyone interested should subscribe to keep up to date with what is going on in the art.

HEAR YE!

Some have asked why we do not use more illustrations. We haven't space. This magazine is the American journal of travel by air—not a picture book. To quote the Sage of East Aurora, "We'll waste no time on parties who cannot see a point unless it is illustrated."

THE REPRESENTATIVES OF THE PEOPLE AND THE WAR DEPARTMENT.

The following was to have been published in the April number but appropriation was killed by, we understand, the West Virginia coal and railroad interests' representative, SENATOR ELKINS, before we went to press. Another year must elapse before a second appeal can be made. Let us hope that in the meantime Congress and the Senate may realize the error of their ways.

In view of the importance of the subject and that it will apply for next year we are printing this—keep it before you for a People's Congress and a People's Senate.

The United States Government has a War Department created by the citizens of this country, to see to it that we keep abreast of the times with regard to means of defense and offense.

There is also a House of Representatives and a Senate created by the citizens, to see to it that out of the money devoted by them through taxation to the running of the Government, the War Department is furnished with the necessary funds to keep up to date.

As regards the application of aeronautical science to defense and offense, we are making no efforts of our own, while France, England, Germany and Italy are spending hundreds of thousands of dollars, and getting value received.

Recalling a recent article in "Omnia" by M. Emanuel Aime, "What will it profit a nation to become mistress of all the seas if a rival nation succeeds in gaining the mastery of the 'Grand Ocean,' the only one truly worthy of this name—of the ocean which has no bounds and whose borders extend above the entire surface of the earth? The French Minister of War over a decade ago subventioned the 'Avion,' the first motor-driven aeroplane to rise in the air with a man, which it did as long ago as 1897, or six years before the first flight of the Wright Brothers."

The War Department asked for funds, a moderate $200,000. The House of Representatives has refused the request. There is still the Senate on which to base meagre hopes.

Our duty is to advise our representatives at Washington that we desire our War Department to be granted their (our) request.

You are urged to write a letter to your Senator, similar to the following and mail it at the earliest possible moment.

Sir:

I desire to call your attention to the fact that the clause appropriating $200,000 for aeronautical purposes was striken from the Fortification Bill by the House Committee.

I would respectfully request you to use your influence to restore this item of $200,000 which was asked for by the War Department, to the place from which it was removed by the House Committee? The United States of America must keep up with other world powers in the development of aeronautics for military use and for national defense.

Of interest, also, is the fact that the International Aeronautical Congress, held October 28 and 29, at The Automobile Club of America, New York, passed the following resolution, a copy of which was ordered transmitted to President Roosevelt:

"RESOLVED, by the International Aeronautical Congress assembled together at New York, that the President of the United States be requested to call the attention of Congress to the advisability of providing the departments of the Government charged with these duties, funds sufficient to establish aeronautical plants commensurate with those of other nations."

$25,000 AMERICAN AVIATION PRIZE FUND.

Dr. Alexander Graham Bell, Mr. Octave Chanute, Professor A. Lawrence Rotch and Mr. James Means have organized a plan for the securing of a $25,000 prize fund by means of hundred dollar subscriptions. A call for funds has been issued, of which the following is a copy.

We have repeatedly urged the need for an aviation prize in this country and all efforts from any source have thus far failed of accomplishment. Let us hope that this new and business-like appeal will meet with a prompt response.

International Sport With Flying Machines.

When Robert Fulton's steamboat first plied the waters of the Hudson any one who

had predicted the achievements in steam navigation which were destined to follow would have been deemed a visionary. If, at the time George Stephenson ran his locomotive engine from Stockton to Darlington, some person had given rein to his imagination and, ignoring flood and mountain, had conjured up a transcontinental "train de luxe," he would perhaps have been considered amusing, probably nothing more than that.

So, at the present day, it avails nothing for the enthusiast to make predictions concerning the future utility and value of the flying machine or of the possibilities of its revolutionizing human affairs.

Considering the present stage of development of the dynamic flying machine, the question is, what are the possibilities for it which are clearly in sight?

Making no predictions concerning economical transportation or military operations, and holding to conservatism in statement, we may assert that the flying machine now offers remarkable opportunities for international sport.

During the last fifty or sixty years yachts have been designed and sailed in a spirit of generous rivalry. The highest type of cruising yacht propelled by sails is the direct result of the competition between the designers of the earlier racers. Of course there came a time when the practical cruisers were left behind by the racing machines, but up to that time the racing was developing the best type of boat.

It is a fine showing as the outgrowth of competition in sport.

Having this in view, we may confidently assert that when those who are the patrons of yachting contests will extend their patronage to contests in the air, the science of aviation will progress rapidly.

International rivalry arouses enthusiasm and thousands take pleasure in witnessing an international contest. The devotees of pure science may well take the high ground that "science knows no country," but when it comes to applied science, international rivalry gives a needed stimulus and incites men to take the rich material which the pure scientists have furnished and to apply it under a waving flag.

Just now the French are witnessing flights which are not to be seen in our country. We ought to see them here and we could see them here, provided we could do as the French have done and raise a large prize fund. Having that, we could invite the French aviators to come to our country and compete. If they come over and win they will teach us much, but we should do all in our power to excel them. In any event they should be made to know that if they come over they will have the same cordial welcome which has been given to the British yachtsmen who from time to time have come over here to compete for the America's cup.

If we are to do anything important this year no time should be lost.

To Those Interested in Aviation.

The undersigned believe that it is possible to find two hundred and fifty persons who will contribute one hundred dollars each toward an Aviation Prize Fund of twenty-five thousand dollars.

Are you willing to be one of the number?

Under no circumstances will subscriptions be payable before August 1st, 1908; if the entire sum mentioned, or a larger one, is not subscribed on or before that date your subscription will be considered cancelled.

JAMES MEANS,
Boston.
ALEXANDER GRAHAM BELL,
Washington, D. C.
OCTAVE CHANUTE,
Chicago.
A. LAWRENCE ROTCH,
Boston.

Boston, April, 1908.

Subscription.

..................................1908.

TO MR. JAMES MEANS,
Box 167, Back Bay P. O., Boston, Mass.

I hereby conditionally subscribe the sum of one hundred dollars to the American Aviation Prize Fund.

Conditions:
No payment to be made before August 1st, 1908.

A notice is to be mailed to me on that date, stating the total amount of subscriptions received. If the total amount is less than $25,000 my subscription is void. If the total amount is $25,000 or more the amount of my subscription will then be payable to the Aero Club of America.

At the conference held in New York, April 18th, on the American Aviation Prize Fund, the following being present: Dr. Alexander Graham Bell, Mr. Octave Chanute, Professor A. Lawrence Rotch and Mr. James Means, a resolution was passed to the effect that the Aero Club of America be requested to lend its co-operation toward the securing of the fund, to act as custodian, and to arrange the rules and conditions for its award.

NEW AVIATION PRIZES.

$1,000 offered by the municipality of Dieppe as the nucleus of an aviation prize; contest to be held at Dieppe at the time of the Grand Prix automobile race over the Dieppe Circuit, July 6-7.

$1,000 has been offered by the Aviation Section of the Aero Club of France to the aviator who flies the greatest distance before September 3. Minimum distance must be that made by the winner of the Montefiore prize.

$1,000 instituted by the municipality of Kiel for an international contest for flying machines on June 28. The duty set is to travel from one point to another, hover for one minute, and return to the start. Three trials are allowed.

$500 has been offered by M. Montefiore, to be held by the Aero Club of France, to the aviator who flies the greatest distance in a closed circuit before June 30. Minimum distance must be 5 kilometers. Entrance fee, $5, notice to be given a day previous.

$440 has so far been raised towards the "25-meter" prize of the Aero Club of France. To win this the machine must rise to an altitude of at least 25 meters. A row of small balloons or kites will be placed at right angles to the direction of the wind and the machine will have to "jump" this hurdle. Entrance fee is $5, notice to be given to the club the evening before.

A complete list of aviation prizes was published in the April number.

MICHELIN $52,000 PRIZE.

The rules for the 1908 share of this prize have been settled by the Aero Club of France. The winner of the annual prize of $4,000 and the $2,000 cup for 1908 will be given to the aviator who flies the greatest distance, exceeding 20 kilometers, before December 31. Trials may be made between 10 a. m. and noon, and between 2 p. m. and sunset. Entrants must send in notice two days in advance, with an additional day's notice for each one hundred kilometers which the selected spot is distant from Paris. The entrance fee of $20 must be paid for each day a trial is made. If the event takes place at a greater distance from Paris than 20 kilometers the candidate must pay the expenses of four officials. The course may be selected by the contestant and marked with three or four posts. The greatest diameter of the circuit must not exceed 1 kilometer. The start to be made between two posts 50 meters apart, and the completion will be reckoned at the last post passed in full flight. An official must be stationed at each post. The prize is open for competition by any one under the control of an affiliated club.

MODEL AEROPLANE COMPETITION.

The Aeronautique Club de France has organized a model competition to be held at the Galerie des Machines, Paris, on June 21. $100 has been offered in prizes.

The first aerostatic contest of the club for the year resulted in starting six balloons.

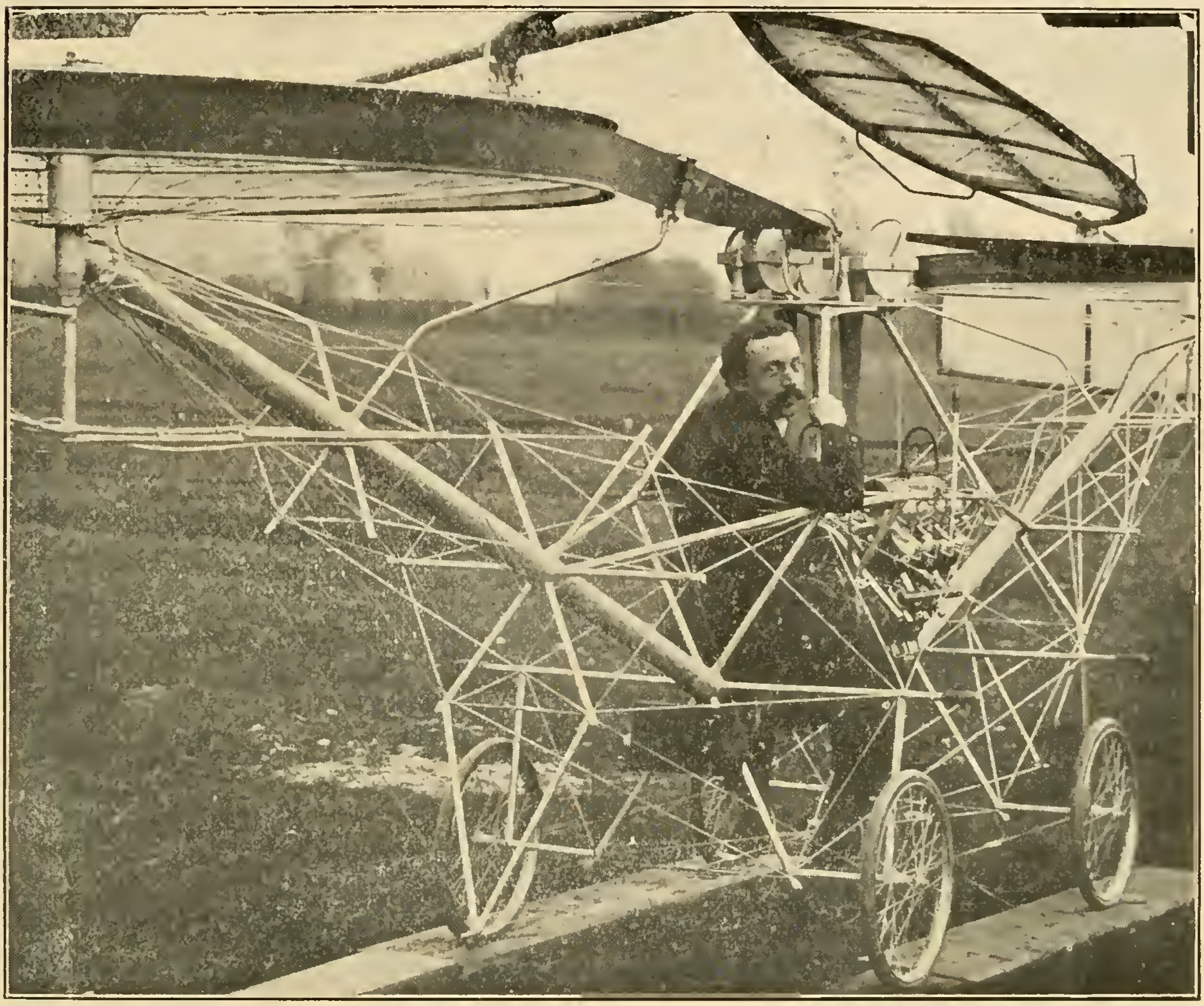
GORDON BENNETT BALLOON RACE.

Two of the German contestants have now been named: Oscar Erbsloh, the winner of last year's race, representing the Berlin Club; and Captain Hugo von Abercron, representing the Lower Rhine Club. An elimination race will be held on May 10 to select the third contestant from among the members of the Cologne club.

The jury is composed of the following: Herr Busley, Major Gross, Major Moedebeck, Captain Hildebrandt and the French delegate, not yet named.

The starters will be Herr Gradenwitz and Lieut. von Selasinski.

THE CORNU HELICOPTER.



Scientific American CORNU HELICOPTER.

Paul Cornu, assisted by a hundred and twenty-five friends, who gave each one hundred francs (total, $2500), planned to build a machine to try to win the Deutsch-Archdeacon $10,000 prize, now gone to Farman.

Cornu has been experimenting with model helicopters for several years and was able to make a model weighing about 30 pounds, fitted with a 2 horsepower motor, lift itself and travel horizontally.

The framework of this first full sized machine is principally a central steel tube of large size, mounted on a 4-wheeled chassis, forming a wide angle "U," braced with longitudinal cables running from end to end over 6-tube "stars" arranged along the main large tube. The length of the whole apparatus is 6.2 meters (20.34 ft.).

In the center sits the aviator, behind a 24 horsepower Antoinette motor. At either side of the operator are the levers for operating the engine and working the two steering and propelling planes at each end beyond the propellers. In front of the engine is a tank of water holding 12 litres (3 gallons) for thermo-siphon circulation. Above the motor is the oil tank. Behind the operator is a reservoir holding 7 litres (1¾ gallons) of gasolene under pressure. Under the aviator's seat is the battery.

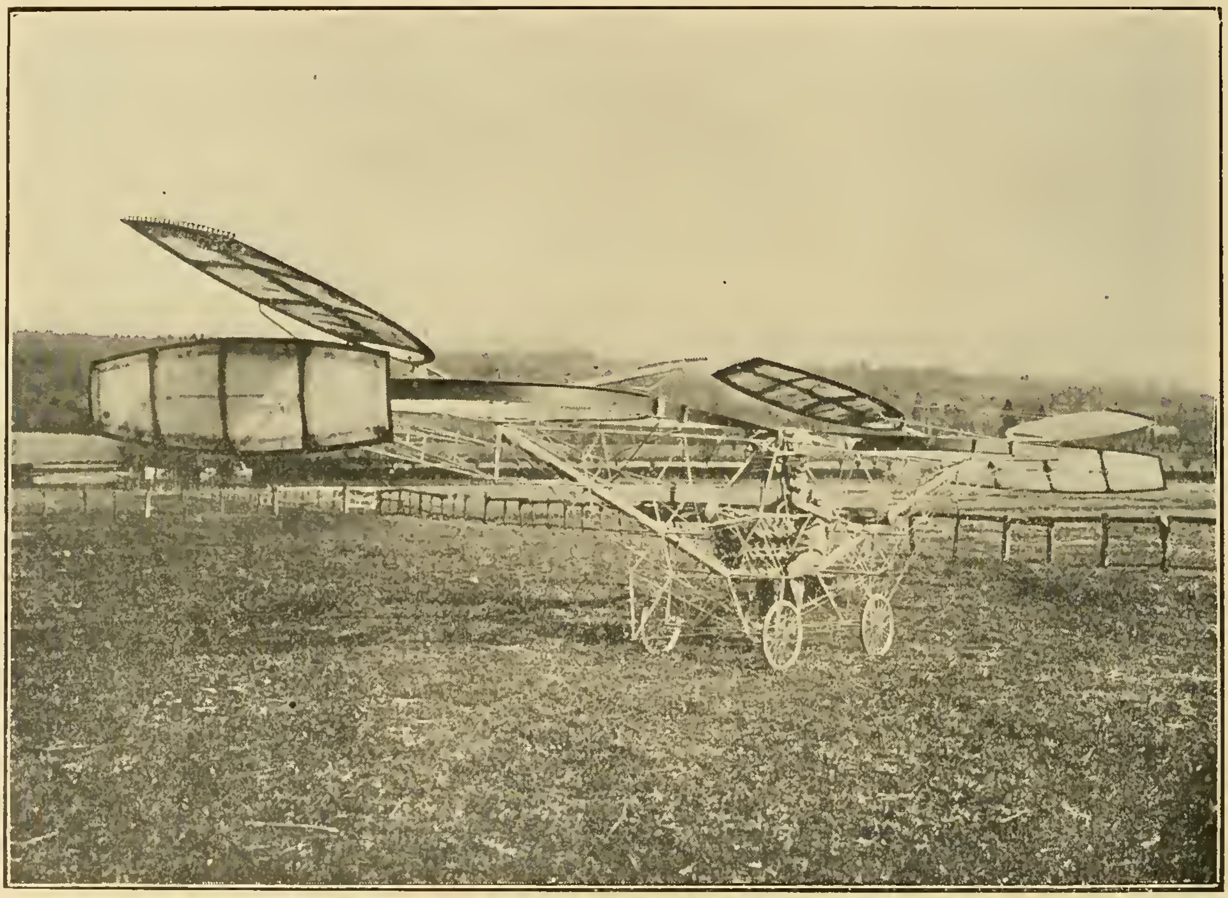
At the ends of this main tube are the two large wire-spoked ball bearing pulleys, 1.8 meters (5.9 feet) diameter, the face of the pulley being a steel plate 1 mm. (.039 inch) thick and 100 mm. (3.93 inches) wide. These wheels or pulleys have aluminum hubs. They not only serve to transmit the power from the motor by means of a leather belt, crossed, 22 meters (72 feet) long, but serve as the central body of each of the two 2-bladed propellers. Above the engine is a plate of aluminum, mounted on 4 steel tubes, on which are affixed, on ball bearings, the two driving pulleys.

The propeller blades are of silk with rubber lining, stretched over a steel tube frame. The length of the blade is 1.8 meters (5.9 feet) and the greatest width 0.9 meter (2.95 feet). The propellers are of variable pitch and the change is accomplished by means of wire cables attached from the edges of the pulley to the rearmost edge of the blade.

The device for propulsion and direction consists of two planes mounted fore and aft beyond the propellers. The propulsion of the apparatus is obtained by the action of the air pressed by the propellers against these planes, the slant of the planes being regulated by the operator. These planes are 2.5 meters (8.2 feet) long by 60 centimeters (1.97 feet) wide. They are arranged to pivot on a horizontal axis passing through their center and mounted on two supports extending out from below the center of the pulley hub. The inclination of the planes causes lateral displacement of the machine, and by swinging them to the desired point the helicopter can be made to turn to the right or left.

The sustention of the whole apparatus is obtained by the rotation at a speed (varying) of about 90 revolutions per minute of the two vertical propellers (i. e., propellers whose axes are vertical). In the recent experiments, sustention has been obtained as soon as the motor developed 12 horsepower, which is only one half its rated capacity.

The results obtained are, shortly, stated as follows: Weight, including the aviator, 260 kilos (573 lbs.); the sustaining surface of the blades, 6 square meters (64.58 sq. ft.); power used, 13 h.p.; weight lifted per horsepower, 20 kilos (44.09 lbs.); weight lifted per square meter of supporting surface, 45 kilos (8.84 lbs. per sq. ft.); traction given by



CORNU HELICOPTER.

the planes, 15 kilos (33 lbs.) average; ascensional force absorbed by the vertical reaction of the air on the planes, 7 kilos (15.43 lbs.).

The Machine Rises.

On March 26th, 1908, more than two hundred people saw the machine rise into the air 40 centimeters (1.31 feet) at Coquainvilliers, near Lisieaux, in Normandy. Some trials of propulsion were made, but they did not give the expected result. The inventor had to struggle against a strong wind. However, the apparatus moved forward and backward.

Previous Experiments.

Three hundred experiments have been made and about fifteen of them have been successful. The great lightness thought necessary has not allowed the apparatus to withstand without damage these repeated trials. The results, however, obtained have proved conclusive enough to cause the inventor to start work upon a second apparatus

of the same type but modified—smaller, more simple, the construction to take about four months. The inventor believes that it is not necessary to make the apparatus as large, and that a helicopter with two propellers of 3 meters diameter, turning with a proper speed, might raise a man without expending more than 15 horsepower, if the total weight is not above 300 kilos. The inventor's first plan was to build a machine with small propellers at high speed, but he decided that it was too much of a departure from known laws.

In the present machine the blades have had to be loaded with sheets of lead, placed for two-thirds of their length, beginning from the center, to balance the lifting force by the centrifugal force. It was then necessary to provide for the equilibrium of the propellers with great precision. The apparatus moved from right to left as soon as the propellers acquired speed. A weight of 55 grams was placed at the end of one blade and 75 grams on the other. Then, when the engine was speeded up, the belt slipped and the driving pulleys had to be lined with leather.

On August 31, 1907, the apparatus was able to rise with a speed of 70 turns of the propellers, the engine turning at 750 per minute. The apparatus was loaded with a 50 kilo (110 lb.) bag of sand placed on the seat. The belt still slipped, and the diameter of the driving pulleys was increased to 1′ centimeters (7.08 inches). On September 27th, 1907, the whole was raised 235 kilos (518 lbs.), the propellers turning at 85, the

Scientific American CORNU MODEL HELICOPTER.

motor at 850, while the pitch of the propellers was 3 meters (9.84 feet).

On November 13, 1907, the first time the machine rose with the inventor aboard, remaining about a foot off the ground for several minutes, descending through slipping of the belt. The screws made 90 and the motor 900.

Lifts Two Men.

In the afternoon of the same day another trial was made, but the front rose higher than the rear and the inventor's brother hung on to the chassis at the rear and was also lifted a distance of about 5 feet. The weight lifted in this instance was 328 kilos (723 lbs.)

Further trials were made, but great trouble was had with the slipping of the belt, and the machine not able to stay in the air more than a minute. On December 4 the whole apparatus rose, all four wheels leaving simultaneously, to the limit of the ropes which were attached after the November 13th trial.

A rubber belt was next tried, which removed the slipping difficulty, but so many trials had been made that the machine had been greatly weakened and it was decided to build the second machine.

Theoretically, with the propellers turning at 100, the planes at 45°, the apparatus should attain a speed of 25 to 30 kilometers per hour.

THE ART OF FLYING.

By Victor Silberer, Editor of the Wiener Luftschiffer-Zeitung.

Seven years ago, when the first number of my "Wiener Luftschiffer-Zeitung" (Vienna Journal for Aeronauts) appeared, considerable surprise was evinced in some quarters by the sub-heading, "Special Journal for Aeronautics and the Art of Flying."

"The Art of Flying"?

Well, to-day there are but few who do not admit that the words were correctly chosen, though the few at that time may have been somewhat premature. To-day not one of those, perhaps, who with an attentive eye have followed the many recent attempts at aviation, will deny the fact that "flying" is an art indeed.

It is, however, an art that is still in its very earliest infancy, an art whose greatest artists are but too well aware that they have yet everything to learn and that they have an intensely arduous and perilous task to achieve in spite of the jubilant cry of theordicians about the problem being solved.

Progress Due to Motors.

But the most remarkable point in the matter is that the great progress and success attained in so short a time in aviation and with dirigible balloons, is not attributable to the conception of aeronautics or aviation at all, but to the manufacture of engines for motor-cars. These modern light motors were originally constructed to meet the exigencies of automobiles, but are at present also employed for carrying out the ideas of aeronauts and aviators in the domain of dirigible balloons and flying machines.

If our poor old Kress here in Austria, at the time when he was in a position to spend the money needful for his "kite-flyer," had been able to obtain one of the modern light motors, his labors and attempts would no doubt have been rewarded with greater success.

The admirably light motors with which aviators are at present provided, may assuredly be regarded as the chief incentive to the construction of numerous flying machines which, whatever may be said against them, enable their inventors and constructors to effect real flights, though ever so short and uncertain, ever so perilous and unreliable.

In all these attempts and trials, however, it will be seen that a motor, whatever its weight may be, and an aviator, however well constructed, and furnished with such a motor, will not suffice to enable a mechanical contrivance to wing its flight successfully, but that there is a third and all-essential condition, and that is—the art of flying, which he who makes aviatic attempts of this kind will have to learn at the daily and hourly hazard of his sound limbs and life, even with the most promising machine.

The Training of The Aviator.

This art, more than any other, will require active energy, courage, decision of purpose, a quick eye and clearness of judgment, utmost presence of mind; also an enormous amount of patience, assiduity and perseverance; and finally, efficient training and physical dexterity.

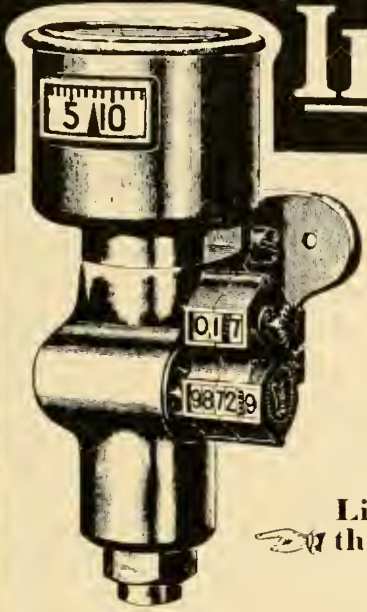
The practical aviator must be endowed with a portion of these qualities at the very outset of his experiments, namely, all the above cited moral virtues in addition to general manual skilfulness and bodily aptitude. Adroitness in managing the technical contrivances and an accurate knowledge of the working capacity of his machine in the air, the peculiarities of its movement, its reaction on all possible influences while flying, the influence exercised by the aviator's different operations upon the action of the machine, the manner of steering, the force needed for the different operations, the innumerable points to be taken into account; all these will, only by long continued indefatigable practice on the part of numerous incipient aviators, lead to such experience as can be embodied in general principles of aviation and which will save much trouble and risk to future beginners.

These pioneers and pathfinders, however, who are now exploring this alluring "terra incognita" from which as yet no beacon of practical experience is sending forth its cheering light, have set themselves a sky-aspiring task as stupendous as it is difficult.

The Dangers.

Even the trials and preliminary practice hitherto show through what extreme

"An Infallible Speed Indicator Test"

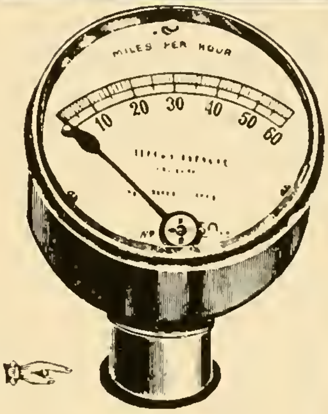


The Auto-Meter

What Does Your Dash Look Like?

Like this?

Or this?



If it looks like this you have the satisfaction of knowing that you have the best speed indicator your money can buy.

It means that you are as near immunity from speed indicator troubles as you can be.

It means that you need never be ashamed to have your wealthiest or most fastidious friend look at it—all the motoring world knows that you couldn't have bought anything as good if you had a million dollars to spend for a speed indicator.

It means that you have the same speed indicator that was on the contesting cars in the New York-Paris race—the only one.

If it looks like this—no matter what price you paid for it,—no one can tell from a distance of fifty feet but that you have a cheap mess of $25 junk.

If it looks like this you have something that will wear out in a few months.

We are at all times willing to put an Auto-Meter on the same dash with any other make—then make this test:

Jack up the wheel of your car to which the Auto-Meter is attached and see if you can turn the wheel so slowly that you can't get a reading. Try it with the other one and see where it begins to indicate.

Then bear this fact in mind that an indicator that is not true at one speed cannot be true at any other.

Thirty Days' Free Trial

Warner Instrument Company, 153 Wheeler Avenue Beloit, Wisconsin

Write us for a copy of our latest book, "The Final Truth About Speed Indicators." It's the sequel to "The Truth About Speed Indicators."

dangers to limbs and lives the disciples of the fascinating art of aviation must expose themselves. Even now, when—most reasonably—they are only trying to glide cautiously along on quite even ground, at a height of but a few metres, downfalls of the gravest and most formidable kind occur. More than one of the bold aspirants to the realms of thin air has encountered accidents in which his life was only saved as by a miracle. But how will it be when once they go beyond the first preliminary attempts? When they are placed before the task of passing from these incipient experiments made, so to say, in the workshop, on the even, unobstructed practising ground, to the infinitely graver and more difficult evolutions above the ordinary pathways of earth, at a height which enables us to rise above terrestrial obstacles, to soar above trees, forests, buildings, cities, what peril of life to the aviator if the motor should stop or any part of the propelling mechanism fail.

By far the majority of the apparatus now used for experiments, such as all those constructed with a cellular or bat-like arrangement, all of which maintain themselves in air only so long as they are propelled with great velocity, do not sink slowly when the motor stops, but are precipitated to the ground like a lump of lead.

How many then will be the accidents, how great will be the loss of life, before sufficient experience has been acquired for producing an apparatus which does not capsize or lose its equilibrium under any circumstances?

And in the event of a sudden failing of the propelling force, of the steerage, or other vital part of the mechanism, will it be possible in these trials with the present apparatus of small superficies, at some considerable height to effect a smooth and safe landing and to preclude catastrophies through contingencies of any kind.

Let us then pay homage to the men who, with iron energy and at the constant risk of their lives, devote their services to the development of aviation and to the acquisition of this newest but most serious and perilous art—the art of flying.

WITH THE AVIATORS.

The end of March the weather was rainy and blustery and little work was done on the field.

On March 24th Delagrange made a flight of 1800-2000 meters. In the afternoon Farman made a double loop of at least 3 kilometers. No poles were erected and the flights were not official. The Farman flight covered the extent of the ground, passing above the heads of the spectators. An official trial was asked for the following day.

On the 25th he succeeded in flying a kilometer-loop at rather a considerable height, 12 meters. The stability was perfect. The official trial, however, was postponed. Gustave Zittel, manager of one of the Paris music halls, was on the field on horseback and raced with the aeroplane. Farman was able to distance the horse easily on account of the turns.

Scientific American

FARMAN IN FULL FLIGHT

In conversation with a correspondent Delagrange said: "Just imagine that within a week I was able to complete my education as an aviator. On the 17th I won by 260 meters the '200-meter prize' offered by the Aero Club of France to encourage beginners; and on the 21st I covered in a loop 1500 meters. Finally, on the 24th, you know,

I made loops quite successfully which have been calculated to be 2000 meters at least." Delagrange expects now to train some pupils.

Farman was out on the 27th but met with an accident. After having accomplished several flights and was practicing curves, he turned too sharply and the wind striking him inclined the aeroplane so that the left wing touched the ground and was broken. Farman was thrown forward several yards but was not seriously injured. Bleriot was timing him to see if he could break his 3 minute-31 second record. After the first flight he stopped, saying that the wind was too great, but soon he started again, when the accident occurred. The machine was flying very low at the time. Farman's machine has since been fitted with a radiator and he hopes to stay in the air for 20 minutes.

The bad weather was employed by Delagrange in perfecting his apparatus. The Antoinette 40 was provided with a supplementary water tank holding 5 liters, making the total quantity of water carried 20 liters. With this quantity the motor can run for 18 minutes without heating at all. To win the Armengaud prize of $2,000 he must stay in the air 15 minutes.

On April 10th Delagrange was able to make 2500 meters and would have beaten the official record of Farman of 2004 meters on the 21st had he not touched the ground while flying for about 3 seconds.

Delagrange Beats the Record for Distance and Duration of Henry Farman and Wins the Archdeacon Cup—Stays in the Air 9 Minutes 15 Seconds and Flies 6 Miles.

April 11. After summoning the Aero Club of France Committee, Delagrange started, at about five o'clock in the afternoon, on his flight around a triangular course measuring 825 meters around. Poles were placed distanced apart 350, 200 and 275 meters respectively. The strong, gusty and irregular wind of the morning had somewhat diminished. For the first two circuits the machine flew close to the ground and

DELAGRANGE IN THE SIX MILE FLIGHT

unfortunately touched the ground twice. Delagrange succeeded in correcting this mistake and made almost five times the circuit of the triangle at about 3 meters altitude. After the second contact with the ground the referees took the time again and he then flew without contact for 3925 meters in 6 minutes 30 seconds. Counting the first two turns the performance lasted 9 minutes 15 seconds, over a distance of 5575 meters (3.46 miles), measured from pole to pole, without any stop of the machine or motor. The flight was ended from sheer physical exhaustion from constant manipulation of the plane and rudder.

Taking into account the circumference of the circles in which Delagrange flew and not merely adding the length of the arcs—from pole to pole—the distance is estimated to be 10 kilometers, approximately 6 miles. It is obviously impossible to obtain the actual distance travelled, but it is likewise obvious that the speed per hour, based on

the time given and a distance of only 5575 meters, would be misleading to a great degree.

Looking backward: on September 3, 1906, the first mechanical flight in Europe—if we count out Ader—was made by Santos-Dumont at Bagatelle. He covered 25 meters on October 23 and 220 meters on November 12. On October 26, 1907, Farman officially flew 770 meters in 52 3/5 seconds; he won on January 13, 1908, the Grand Prize Deutsch-Archdeacon $10,000 by 1,000 meters in 1 minute 23 seconds, and on March 21 doubled his record, 2004.8 meters in 3 minutes 31 seconds.

GLIDING THE NEW COMING SPORT.

By A. C. Triaca.

If all people are not sufficiently wealthy or courageous to try a trip in a flying machine with a motor, gliding is a sport which is becoming popular in a short time because it is very pleasurable and hot costly.

With $10 or $15 you can build yourself a glider and try the very enjoyable sensation of being in the air. It is a sport that does not require very much physical strength, is very healthful and, at the same time, demands the faculty of being cool. Gliding is the first step to the flying machine with motor; it is the first step to learn to be a bird; it is the first step to learn equilibrium when you are in the air. I do not know of any reason why gliding should not be as popular as all the other sports.

On Saturday and Sunday, May 2d and 3d, Messrs. A. B. Levy, L. J. Fishel, L. R. Adams, W. R. Kimball, Daniel L. Braine and V. W. Vorse, all members of the Aero Club of America, the latter two gentlemen being also students of the International School of Aeronautics, made some very successful glides at Locust Valley, Long Island. Owing to the weather conditions the experiments were discontinued on the 2d after only a few glides had been made, but on Sunday, the 3d, much work was accomplished and about 125 glides were made during the day. The length of the glides varied from 40 to 45 feet and in some cases the machines were raised 18 to 20 feet above the ground. The wind was blowing 18 miles per hour. After a few experiments, an improvement to the apparatus was made by fixing a front rudder, but this was abandoned later for a rear tail, which gave better results.

I am so well pleased with the work done by Mr. Braine, building his seventh gliding apparatus, that I have offered gold and silver medals for the longest flights with gliders. The conditions will be made public in the course of a few days, and there is every indication that the contest will be a very interesting and instructive one.

Messrs. Archdeacon, Farman and Santos Dumont have bet $1200 against M. Charron's $2400 that an aeroplane will carry two passengers over a kilometer course within one year.

The Hon. C. S. Rolls has just made the first trip in his new Lilliputian balloon "Imp" of 11,000 cubic feet. It is the smallest balloon in England.

The new company now being formed in Paris for the construction of airships is a sign of the times, and shows that in many quarters the dirigible balloon is considered to have reached the stage of a practicable science. The new company, to be known as the "Société Française des Ballons Dirigeables," is being founded by the well-known aeronautical engineer, M. Mallet, whilst Comte Henri de la Vaulx will have charge of the technical department, and be aided by André Schelcher, of the firm of Panhard-Levassor. The company will produce the ordinary type of airship which up to the present has given the best results.—The Car.

No fewer than thirteen aeroplanes either exist or are under construction in the vicinity of Paris. Nine have already been experimented with, and four have yet to be tried. The nine belong to Santos-Dumont, H. Farman, Esnault-Pelterie, L. Bleriot, H. De la Vaulx, Vuia, Delagrange, De Pischoff and Gastambide-Mengin. The untested machines belong to E. and P. Zeus, Ferber-Levavasseur, Kapferer-Paulhan and Reissner.

The French aviator and motor manufacturer, Pelterie, has placed on the market a 60 h.p. 14-cylinder engine weighing 98 kilos, or 3.6 pounds to the h.p. Other sizes made by the same firm are the 20 h.p. with five cylinders, weighing 37½ kilos; 30 h.p. with seven cylinders, weighing 52 kilos.; and 40 h.p. with ten cylinders, weighing 72 kilos.

THE HELICOPTERE.

C. H. Chalmers, E. E.

In a great many respects the helicoptere is one of the most interesting types of dynamic flyers. To be able to fly has ever been the dream of mankind, and to some extent the longed for condition has been realized. But if we are to do the thing right, we should have a machine that can remain stationary in the air over a given point, rise or descend vertically and move forward at any speed from the slowest up to the maximum for which it was designed. It is further desirable that a given flyer, which is designed for a certain carrying capacity at its maximum speed, shall have an increased carrying capacity at reduced speeds.

In nature, birds, bats and insects, and to some extent animals and fish, are endowed with powers which enable them to leave the surface of the ground or water and remain in the air for greater or less periods of time. Nature has also provided most living animal organisms with means for locomotion over the surface of the earth, and this, too, in widely varying degrees.

As the human species has from time to time improved its condition by adding artificial powers to those bestowed by nature, the tendency has often been to imitate nature in her gifts to the lower animals. In the field of artificial locomotion this has been true, but it is particularly noticeable that the largest success has accompanied quite radical departure from nature's methods. The row-boat is propelled like the fish with its propelling fins, while the screw propeller of our ocean liner is much more of a departure from nature's method and correspondingly more successful as an artificial means of locomotion for mankind.

Some of the earliest locomotives had legs or kickers to push them forward, but our swift transcontinental trains and our automobiles are better in all respects, even though they fail to imitate at all the jack-rabbit, the ostrich or the race horse, though the latter are among the best productions of nature.

Lillienthal, Pilcher and some of the other early gliders made wings like birds. Later, Chanute, the Brothers Wright, and others, made double decked wings and gliders; and later still the Wrights and Farman added screw propellers to their double decked wings. Like huge eagles these machines have to gain a headway on the ground before they can rise and fly.

It seems to the writer that most machines of this character are properly to be called "Artificial Birds" rather than "Flying Machines."

The helicoptere, with its vertical shafts and revolving blades, seems to be the type to which inventors of engineering experience must ultimately be driven, because it is in its very nature a "Machine Type" of flyer and in line with man's solution of the problem of locomotion over land with his revolving locomotive driver, and over sea with his revolving screw propeller and in that such a mechanism by its nature embodies so many highly desirable characteristics.

The great difficulty with the helicoptere has been its excessive power requirements. While the Wright Brothers flew 40 miles per hour with a total weight of nearly 1000 lbs., they are said to have used only a 16 h.p. engine. On the other hand, Bertin used a 150 h.p. engine, lifted somewhat less and didn't fly at all. The giroplane, which is really a modified helicoptere, did better and lifted 1200 lbs., or more, with a 45 h.p. engine.

The excessive power requirements of helicopteres are, I believe, entirely unnecessary and when once this obstacle is overcome, the helicoptere will quickly supersede the "Artificial Bird" type now occupying the center of the aeronautical stage.

The great fault from a power-consuming standpoint with all helicopteres is that they are air movers, rather than lifters. The revolving blades strike the air, get some reaction, but start the air particles downward at a high rate, and when the second blade comes around the life is knocked all out of the air and the result is small lift and enormous fan effect with great waste of power. What is wanted is great diameter of blade and high peripheral speed and low angular velocity. These proportions must be carried to such an extent that the outer ends and effective part of the blades move at high velocity and in fresh, undisturbed air.

By the high velocity we shall get the advantage of the Langley law, viz., that the higher the speed, the less the power to support a given weight. By the large diameter, we shall have our blades moving in undisturbed air and so get the maximum reaction from each particle struck by the revolving blade.

The trouble is that as the diameter and peripheral speed increase, the strains of every character increase and this forces the weight up and up until the gain in the one direction is offset by the loss in the other.

Realizing the difficulties just set forth, I have set myself to the task of designing a pair of revolving blades 30' 0" in diameter to revolve at 300 rev. per min. and be strong enough to stand the strain due to the enormous centrifugal force and also an upward

reaction or lift of 500 lbs. I have the blades finished. The pair weigh 54 lbs., including the hub for fastening them to the vertical shaft. As soon as the weather gets warm enough to be outside with comfort, I have arranged to attach the blades to a vertical shaft where I can conveniently measure the lift and speed. I shall drive the vertical shaft with an electric motor of predetermined efficiency and in this way get the data for plotting curves of lift and speed, of lift and horsepower as well as speed and horsepower. I shall be glad to give out the results of these experiments to the aeronautical journals as soon as I get them, for I believe the subject of aerial navigation is too big for one man or a few men to adequately solve by themselves and so success will come only by each one adding his mite to the present store of knowledge on the subject. I might say that I shall be pleased to get in touch with helicoptere enthusiasts by mail, as I feel we can, by working together, soon get better results than our aeroplane friends.

AERONAUTIC CALENDAR.

May.—Contest for balloons at Bordeaux of the Aero Club Sud-Ouest on the 10th. Distance balloon contest of Aero Club of France on the 16th. International Aeronautical Congress of the F. A. I. at London on the 27th, 28th, and 29th. International balloon "point to point" balloon race of the Aero Club of United Kingdom at Hurlingham Park on the 30th. Distance balloon race at Barcelona, Spain, on the 17th; $2,900 in prizes and gas free. Grand Prix balloon race of the Aero Club of France on the 24th. Aeronef contests at Munich. Contest for gliders, Aero Club Sud-Ouest on the 24th.

June.—Aero Club of France balloon race on the 11th. Balloon race at Tours on the 21st. Competition of aeroplane models at the Galerie des Machines, Paris, auspices of the Aeronautique Club of France, on the 21st. Distance balloon contest of Aero Club of France on the 28th. Aeroplane contests at Kiel for $1,000 on the 28th.

July.—Balloon race at Brussels on the 19th. Flying machine contests at Spa on the 12th, 19th and 26th.

September.—Grand Prix of the Aero Club of France. Aeroplane contests at Vichy.

October.—Grand Prix, Aero Club of France, on the 4th. Distance contests and contests for objective point at Berlin on the 10th. Gordon Bennett International Balloon Race on the 11th. International aeroplane contests at Venice for $5,000 in prizes.

1911.—International Assembly of dirigibles in Italy under the auspices of the Societa Aeronautica Italiana.

INTERNATIONAL AERONAUTIC FEDERATION CONGRESS.

The 1908 congress will be held in London at the Royal United Service Institution, Whitehall, London, S. W., beginning on the 27th of May. On the afternoon of the 28th the delegates will visit the military aeronautic park at South Farnborough. On the evening of the 29th the Aero Club of the United Kingdom offers a banquet at the Hotel Ritz. An international "point to point" balloon race will be held on the 30th from the grounds of the Hurlingham Club. The winner will be the competitor who lands nearest to a point to be designated immediately before the start. The race is limited to thirty-five balloons. A breakfast will be given at the Hurlingham Club on the 31st.

It is of interest to note the following request made by the English club in connection with this race: "In view of certain representations which have been made to the Committee of the Club respecting trailing, they deem it advisable to draw the attention of competitors to the fact that trailing, unless very carefully conducted, is likely to do considerable damage to property, and thereby bring ballooning into discredit. The Committee, therefore, hope that all competitors will take particular care only to trail in suitable country, and to at once rise when there is any likelihood of a rope doing any damage."

SANTOS DUMONT AND HIS "MIXTE" AGAIN.

Santos Dumont has another combination balloon-aeroplane, but using the old "No. 16" envelope. The apparatus is 25 kilos heavier than the air, with Santos Dumont aboard. The capacity of the balloon is 99 c. b. m. (some authorities state 115, some 125), with a small balloonet of 4 c. b. m., filled automatically with air by a ventilator connected with the engine. Two small 6-8 horsepower, 2-cylinder Dutheil & Chalmers motors drive two propellers placed in front. He expects to get "60 kilometers an hour" out of this combination. The framework weighs 40 kilos.

A MILITARY RECONNAISSANCE IN A BALLOON DURING THE RUSSO-JAPANESE WAR.

F. A. Postnikov, Late Lt.-Col. Russian Army.

Can anyone who has ever been flying in an aerostat above the clouds forget the exhilarating sensation unknown to less fortunate beings, creeping, as it were, along the earth's surface?

Just as it is impossible to explain to a blind man the impressions made by different colors, so it is equally impossible to explain the motives which urge an aeronaut to yearn for the boundless expanse of the heavens above.

After experiencing this sensation, his enthusiasm is so great that he seems to forget the ties of love and family which bind him to earth. Little does the unthinking average man, amid the duties of our modern hurly-burly life, realize the trouble, expense and tedious preliminary work which goes with this fascinating form of work. To share some of my impressions with my new comrades, American amateurs in aeronautics, I will describe one of my free flights from Vladivostok.

On the morning of the 25th of April, 1905, such a thick fog obscured the sea and surrounding country, that it was impossible to distinguish an object thirty feet distant. The direction of the wind was favorable (S.S.E.) and at a variable velocity of 6 to 9 metres per second.

At about 11 a.m., the fog began to disperse, and I gave the order to start, filling the small round balloon "Chajka" (Sea-Gull), which has a volume of 400 metres. The gas was taken from the kite balloon, which had already been working several days. At 12 o'clock the "Chajka" was ready. Twenty minutes later, the Russian Navy flag was run up and we took our places in the basket. After ten minutes more the guide-rope parted from the earth's surface and the balloon began to ascend and took a N.N.W. course.

My companion was a young officer, S. Kovanko, the nephew of the renowned Russian military aeronaut, General Kovanko. It was the young man's first experience in free flight and he was beside himself with rapture. But this was no time, during the war, to spend much time in enthusiastic contemplations. Each moment presented something new which had to be reported afterwards. Our pencils worked continuously on the maps and note-books. The data thus obtained was important as well as interesting. The most characteristic feature of this trip was the extreme variation of velocity of the wind at different altitudes, while the direction remained about constant, as shown in the accompanying tables:

Height above sea level in meters.	Average velocity in meters per second.
320	4.0
4000	5.0
420	8.0
380	8.0
315	10.0
600	13.3
480	6.9

Height above sea level in meters.	Average velocity in meters per second.
800	9.4
900	15.0
1500	10.0
landed	11.0

This shows that the maximum velocity was not at the highest point, but at 900 meters, 3,940 feet above sea level, where it was 15 meters per second.

During the trip, it was possible to see and make sketches of fortifications, camps, barracks, moving detachments and engineering works along the whole line from Port Vladivostok to the town, Nikolsk, a distance of about 50 miles. When "Chajka" was near the latter town and we were engaged in sketching, our occupations were interrupted in the most unexpected manner. First we heard the peculiar whistle, so familiar to us, of several bullets, but we paid no attention to them, believing that the firing was a mistake of some foolish soldiers, and that it would soon stop, but suddenly a distant command reached our ears, and almost simultaneously we heard a sound like the buzzing of several hundred bees, above, below, on every side of us. It was obvious that the Russian infantry did not recognize the navy flag waving above our heads and were trying to puncture our balloon with their shots. We tried to silence them by showing a white flag, as a sign of our peaceful intention, but that made the situation worse, for they guessed that we were within range and uninterrupted "rapid firing" was ordered.

Although we had cast out our last remaining cask of ballast of sand, for 8 minutes we were in the midst of a continual buzzing, such as only a bear coming to eat honey from a big bee-hive might hear, until the balloon ascended to a height of more than 1200 meters above the ground, where none of the metallic bees could reach us at all. Soon afterwards, owing to the lack of ballast, we were obliged to end our flight. But to descend was not so easy, as it seemed at first. A fresh breeze had sprung up near the earth, so that at our descent the velocity of the wind was 11 meters, as it was shown by the measurements taken immediately after alighting. In spite of all precautions, we were pulled along the hills among the bushes with terrible speed, lost our hats and overcoats and broke several meteorological instruments. We were finally obliged to use our "cutting devices," which we use only in emergencies.

However, we had accomplished our task satisfactorily and except for some light cuts on our hands and faces came out of the adventure safe and sound.

JUNIOR AERO CLUB OF THE UNITED STATES.

Since the formation of the Junior Club, as announced in the February number of Aeronautics, Miss E. L. Todd, the organizer, has worked indefatigably to bring about results.

The club now has a real organization, with the following officers: President, Harold L. Platt; 1st Vice-President, Donald M. Roy; 2nd Vice-President, John Miller; 3rd Vice-President, Cornell De Loiselle; Recording Secretary, Arthur Ober; Corresponding Secretary, Clifford Swayne; Treasurer, Percy Pierce.

Many boys have the spirit of invention, but, by reason of their environment and few advantages, lack frequently not only information as to the prior state of the art, but the knowledge of the principles of mechanics. The object of the organization is to try to save the young experimentors discouragement from too many mistakes.

On February 22 the first outdoor meeting was held in the form of a kite flying contest. About a hundred persons attended, Junior Club members as well as members of the Aero Club of America. Seven styles of kites were represented. Mr. Wilbur R. Kimball demonstrated with a Bell tetrahedral kite that by careful disposition of ballast it could be made to go into or against the wind.

On April 4 A. Leo Stevens invited the boys to the roof of his balloon factory where a hydrogen gas generator had been set up and materials provided, also through the kindness of Mr. Stevens. A hundred small rubber balloons were sent up, usually in groups of three or four, tied together, with a parachute and "return" card. Some of the balloons traveled 5 and 6 miles. The day was very cold and the gas not very good. It is suggested that the Weather Bureau might make use of the enthusiasm of the boys and furnish registering instruments to such boys as would furnish a suitable balloon.

The boys attended the lecture and demonstration at the 71st Regiment Armory on April 30.

With the assistance of Miss Todd, Captain T. S. Baldwin, A. Leo Stevens, Wilbur R. Kimball and Lee S. Burridge, the boys have been taught how to cut and make hot air balloons; cut and make gas balloons of paper and fabric; make nets; make hydrogen gas and fill balloons with hydrogen; make paper parachutes; cut and make small dirigible envelopes; make rubber motors, gliders, etc.

A. C. Triaca, Director of the International School of Aeronautics has invited the boys to visit his school and have explained to them the photographs, instruments, models, etc., and to enter into a demonstration and contest of small models of flying machines, with or without motor, for a prize.

It is planned to have in the very near future a contest of a dozen or more gliding machines, built and manned by the Juniors.

A. Holland Forbes and William F. Whitehouse, who have been contemplating a long distance balloon trip starting from San Antonio, Texas, have given up that place as a starting point on account of unsatisfactory gas, and will make the try from some other western city.

The bet between M. Charron and Santos Dumont, in which the latter gave M. Charron a check for $1000, has been devoted to the lauding of aviation. The $500 won by Santos Dumont from M. Charron, and the $500 by Archdeacon from the Marquis de Dion, have been added to the 1000 for a monster aviation banquet.

INTERNATIONAL AERONAUTICAL CONGRESS.

President: Professor Willis L. Moore.
Secretary: Dr. Albert Francis Zahm. Chairman Gen'l Committee: Wm. J. Hammer.
Chairman Executive Com.: Augustus Post. Sec'y Committees: Ernest La Rue Jones.

Publication Notice.

The addresses, papers and discussions presented to the Congress will be published serially in this magazine, and at the earliest date possible, bound volumes will be distributed without charge to those holding membership cards in the Congress. Others may purchase the volume at a consistent price when ready or may take advantage of immediate publication by subscribing to this magazine at the regular rate.

In accordance with the program as published in the November number, the informal addresses of the Gordon Bennett contestants and others were concluded before entering upon the printing of the formal papers and discussions.

The tenth, eleventh and twelfth papers are presented in this issue, viz: "On the First Observations with Sounding Balloons in America Obtained by the Blue Hill Observatory," by Professor A. Lawrence Rotch, Director;

"The use of Upper Air Data in Weather Forecasting," by Professor A. J. Henry, U. S. Weather Bureau; "The Possibility of Extending our Knowledge of the Sun and of Atmospheric Absorption," by Professor W. J. Humphreys, Director of Mount Weather Observatory.

ON THE FIRST OBSERVATIONS WITH SOUNDING BALLOONS IN AMERICA, OBTAINED BY THE BLUE HILL OBSERVATORY.

Professor A. Lawrence Rotch,

Director of Blue Hill Observatory.

In view of the late hour, I shall only give the history of the work, and a few results. The first observations with the sounding balloons, or registering balloons, were made in France in 1892, balloons holding several thousands of cubic feet of hydrogen gas, carried registered instruments, from which a record of the height could be got, and the corresponding temperature at that height. These balloons lost gas gradually, after reaching the highest point, and floated away to a great distance, some of them travelling as much as seven hundred miles over Europe. Most of them however were found and returned to the senders.

A few years ago an improvement was made in this method by Dr. Assmann of Berlin, who substituted closed rubber balloons filled with 100 cubic feet of hydrogen, which rose to the greatest height until they burst by the expansion of the gas and thereupon a parachute brought the instrument down to the ground safely within a relatively short distance of the starting point. There was not only an advantage by reason of the easy way in which the balloon could be filled and handled, but there was the advantage that it travelled a comparatively short distance, and was soon brought back to the starting point. But the great advantage meteorologically, was that it mounted upward with an almost constant velocity of ascent, and instead of falling gradually to the ground as the other balloons did, it fell rapidly, and at an almost uniform rate. In this way sufficient ventilation of the thermometer was obtained, thereby insuring not only an accurate record of temperature during the ascent, but also during the descent.

The first use of these balloons in America was made by me in 1904, during the St. Louis Exposition, with the co-operation of the Departments of Liberal Arts and Transportation. These experiments have been continued at St. Louis since, and up to the present time nearly 80 balloons have been sent up. St. Louis was selected for the same reason that it was chosen as the starting point of the international races, because it was in the center of the Continent, and the balloons would all fall on land. These balloons are in the air usually between two and three hours. They rise for about an hour, then burst and fall to the ground in another hour. Nearly all these balloons were recovered and returned to Blue Hill by express.

The President: What altitude is gained in this two hour flight?

Prof. Rotch: The balloon rises in the first hour to a height of eight to ten miles.

It is a surprise that so great a number of these balloons are recovered. Out of 56 balloons dispatched up to the present year, 53 were recovered and sent back to us, most of them with good records. I have grouped the results of the travel of these balloons in this table, according to altitude, this table having been prepared for the use of the manned balloons competing in the Gordon Bennett race.

Number of Balloons	Mean Altitude at which Balloons Travelled	Distance travelled from St. Louis	Direction from St. Louis	Mean Velocity, Miles per Hour
9	26,000 ft.	117 miles	S. 81° E.	47
16	20,000 "	155 "	S. 85° E.	56
13	12,000 "	101 "	S. 87° E.	38
8	6,000 "	42 "	S. 79° E.	25

From this data I predicted that the racing balloons, which I assumed would have a mean height of 6,000 feet, should travel with a velocity of 25 miles an hour, and go towards a point slightly south of east. This was nearly verified. The balloons moved at almost exactly the speed of 25 miles an hour, but went a little north of east instead of south of east.

So much for the directions and velocities—for the chief object of these experiments was not to determine the course of the balloons, because the velocity of the air currents at different heights was already pretty well known from the directions of the clouds observed at Blue Hill Observatory and at the Weather Bureau stations. The main interest is in the temperature at various heights. While the temperature increases pretty uniformly at the rate of about one degree in every 300 feet, up to a height of some 8 miles, varying according to the season, above that altitude there is no longer an increase of the temperature but often a decrease; in other words, it usually becomes warmer. In the Summer and Autumn this warm stratum comes lower down, but in Winter it is higher up.

The President: How was this determined?

Prof. Rotch: It was determined from records of some 50 balloon ascensions grouped according to seasons. We have observations made in every season and while the data were somewhat unequally distributed, I think subsequent observations will not modify them very much. This warmer stratum has been located in Central Europe at a lesser height, namely, about seven miles. Now it has been observed at St. Louis, which is further south, at a higher level. It is reasonable, therefore, to assume that this warm current is a general condition at some height above the earth. At ten miles above the equator we saw no sign of it, but in the polar regions it has been found considerably lower, so far as observations have been made.

The President: How did you get the observations at the equator?

Prof. Rotch: By two balloons coupled together which were sent up from the yacht of M. Teisserenc de Bort. One balloon burst and, with the inflated balloon, sank to the ocean where it served as a guide to the ship, which steamed after the balloon and recovered the instrument.

The President: I understand that observations recently made in the Arctic have brought out the same facts, that a warm stratum lies below 8 miles.

Prof. Rotch: Yes, and it probably exists over the equator at a height exceeding ten miles. In a diagram showing a vertical section of the atmosphere over St. Louis, it is seen that at 8 miles high the seasonal effect is no longer dominant, as the temperature is nearly constant throughout the year. Above 8 miles there is this relatively warm current; that is, to say the temperature increases to more than 72° Fahrenheit below Zero. The lowest temperature obtained in any ascension was 111° Fahrenheit below Zero. This, to my knowledge, is one of the lowest temperatures ever recorded, either on the earth or above it.

The President: What date was that?

Prof. Rotch: During a high barometric pressure at the ground, on January 25, 1905, at a height of 48,680 feet. In the following July we obtained a minimum temperature of minus 75° Fahrenheit, at a height of 45,110 feet.

I do not think I shall do any more in this matter. Having shown that these balloon ascensions are practical, I believe the Weather Bureau will take them up. In fact, since Dr. Blair has been detailed to watch Mr. Fergusson's experiments at St. Louis, it is expected the Weather Bureau will undertake this work on a large scale. Almost all of our balloons have been recovered, which shows that the people are ready to co-operate in sending them back. A very small reward, only $2.00, is offered for the return of these balloons, but it saves a great deal of trouble. All the ascensions have been made from St. Louis.

The President: Everything in regard to the exploration of the upper air on the part of meteorologists, has a direct bearing on the problems that are considered by those engaged in aeronautics; that is why we have a number of papers by the meteorologists of the Government.

I will say a word in relation to Prof. Rotch's work at St. Louis. It is the intention of the Weather Bureau to make a number of ascensions simultaneously from a large number of places in the West within the next year, the object being not to get extremely great altitudes from one particular city, a large number of times, valuable though such data are or may be valuable as the work Mr. Rotch has been doing, but to send several balloons up, liberating them simultaneously in the four quadrants of the storm, the four quadrants of a cold wave—exploring a given storm, exploring a given cold wave. That is one of the lines of research that has been planned to be conducted from the headquarters at Mt. Weather.

See the July, 1907, number of "Aeronautics."

ATMOSPHERIC EXPLORATIONS CONDUCTED BY THE BLUE HILL METEOROLOGICAL OBSERVATORY.

At the Milan meeting of the International Commission for Scientific Aeronautics it was decided to concentrate the work of exploring the air upon four grand series of ascensions, in addition to the usual monthly ascensions. The former last several days and observations are to be obtained not only by balloons and kites but also by special observations of cloud drift and upon mountain summits. The first of these quarterly ascensions was appointed for the week commencing July 22, 1907, and, as has been the case for several years, co-operative kite-flights and cloud observations were made at

Blue Hill Observatory. It is supposed that the United States Weather Bureau station at Mount Weather, Virginia, which has recently taken up the work of exploring the free atmosphere, also participated in this series of ascensions.

Unfortunately light winds prevailed at Blue Hill during almost the entire week, so that but four kite-flights were possible and only on the 27th was the height of a mile and a half attained. During an evening flight the top kite and the meteorograph broke away and the latter has never been recovered. Had a small steamer been equipped for kite flying in Massachusetts Bay, as was done for the first time by Professor Rotch in 1901, the kites would have been rendered independent of the wind by the motion of the vessel, either in the direction of the wind or against it, for, in order to lift the kites, a velocity of at least 14 miles per hour is required, which is more than the average velocity of the wind in Summer on Blue Hill. Kite flying was continued during the following week in more favorable conditions and of the three flights, the highest, on August 2, reached an altitude of nearly 2 miles.

Although no efforts were made in America to secure observations over the ocean, as was done abroad, Professor Rotch, the Director of the Blue Hill Observatory and a member of the International Commission, extended his field of work by sending Mr. Clayton to the White Mountains (Mt. Washington, Bretton Woods) to obtain observations in the free air at the height of Mt. Washington and on that mountain itself. Such an investigation had already been conducted privately by Mr. Fergusson, of the Blue Hill Observatory, who had installed self-recording instruments on the summit of Mt. Washington and at Twin Mountain station for the purpose of comparing the conditions on the mountains with those shown by instruments lifted by kites to the same height. Between July 21st and 28th Mr. Clayton obtained three such series of observations with kites at a height exceeding that of Mt. Washington (6,300 feet) and on the days when the wind was too high to lift the kites, he carried the instruments up the mountain. The records seem to indicate a greater wind velocity on top of the mountain and probably a lower temperature than in the free air.

Professor Rotch resumed the work of exploring the air at great heights by sending up more sounding balloons from St. Louis in October. The successful experiments already conducted there being described in the first issue of "Aeronautics."

The situation of Blue Hill on the Atlantic Coast precludes the use of balloons, but St. Louis has proved an excellent place for this work.

The first sounding balloons to be used in New England were sent up from Pittsfield on May 7, 1908, the international day for balloon and kite ascensions.

THE USE OF UPPER AIR DATA IN WEATHER FORECASTING.

Prof. Alfred J. Henry, U. S. Weather Bureau.

A considerable mass of upper air data has been accumulated within the last ten years, particularly in Germany, France, and at the Blue Hill Observatory in this country. These data have been used largely with a view of testing the various theories of cyclones and anti-cyclones which are found in the literature of meteorology and in determining the distribution of temperature and moisture at various altitudes.

The application of upper air data to problems of weather forecasting is yet apparently, in its infancy. The writer, as one of the forecasters of the United States Weather Bureau, in Washington, D. C., has had the opportunity of comparing upper air conditions, as obtained by kite flights at Mt. Weather, Va., with the general meteorological conditions over the eastern part of the United States, as shown by the 8 p. m. daily weather map, and of drawing conclusions which may be useful in the art of weather forecasting.

The problem which confronts the forecaster is essentially one of determining in advance, the path and rate of movement of anti-cyclones, commonly referred to as areas of high pressure, or simply highs, and cyclones, commonly known as areas of low pressure, or lows. It will be readily understood that any inaccuracy in predicting either the course pursued by these great atmospheric whirls, or the rate of their movements will result disastrously to the forecasts. The forecaster has at his command surface conditions only; it is but natural, therefore, that one of the most promising lines of work looking to improvement in the forecasts lies in the study of the air

conditions in the zone or level in which cyclonic and anti-cyclonic action is constantly occurring.

The first step in the work naturally is an endeavor to correlate the observed data of the free air with the known facts concerning the development and movements of highs and lows. If thereby a clearer insight into the mechanism of either the high or the low can be gained, by just so much will the art of forcasting be improved. Thus, for example, if the depth, or vertical thickness of a low were known one would be able by means of surface observations which now give its horizontal dimensions, to exactly delimit its position in the atmosphere. This additional knowledge would greatly add to the ability of the forecaster to correctly outline the future course and intensity of the storm. It is now known that deep barometric depressions have quite different characteristics from shallow depressions.

Kite observations, when made consecutively, afford the forecaster an opportunity to compare the daily temperature changes aloft with those on the surface. The relation between such changes and their bearing upon the coming weather is an important consideration. Another factor of greater or less significance is the possibility of determining from the temperature and moisture conditions aloft whether clouds will form, what changes existing clouds will undergo, whether they will increase in density and assume the blanket form or break up and disappear. These in general are some of the possibilities of the use of upper air data in weather forecasting.

The material afforded by the kite observations during the past Summer, was confined to air pressure, temperature and wind direction. Let us now consider, briefly, its application to the problem in hand. In the beginning, it was used largely to strengthen and confirm the conclusion which was obvious from the surface conditions; to dispel uncertainty when possible and, in general, to illuminate the situation as it appeared from the surface conditions only.

Perhaps the element which was most useful in the beginning was the direction of the wind in the upper layers. The observations on this point disclosed one or two facts of particular interest and importance to members of this congress, viz.: the marked tendency of east and south winds to shift to the right with increasing altitude. This fact was brought out in the Blue Hill kite observations and is fully confirmed by those made during the past summer at Mt. Weather. The altitude at which the shift occurs varies, but is generally below 3,280 feet, (1,000 meters). The deviation in the case of westerly winds however is about as apt to be to the left as to the right and this is particularly so in certain types of pressure distribution.

While the direction of the wind is an important consideration to the forecaster the depth of the several layers having different directions is still more so, since, by knowing roughly the latter, he can form an approximation of the height to which the atmosphere is disturbed by the circulation of the high or the low, as the case may be, and consequently the intensity of the storm and the probable extent of territory affected by it. In one case during last summer the early dissolution of a low was foreshadowed by the fact that the wind circulation proper to it extended upward less than 2,500 feet, (762 meters) above the station.

The depth of currents which clearly belong to the circulation of highs and lows seems to vary between rather wide limits. In the case of easterly winds, which in most cases are caused by the approach of a low from the west, the altitudes attained by such currents were found to be generally less than 2,000 feet, (610 meters); thus in 12 cases of east to south winds the average depth of the surface winds was 1,682 feet above the station, the maximum depth was 2,631 feet, the minimum 349 feet. In the case of winds

between north and east, the average of 6 cases was 3,033 feet, (924 m.) the maximum was 6,735 feet, (1,943 m.) and the minimum was 1,181 ft. (360 m.) The maximum depth, 6,735 ft., was caused, however, by an anti-cyclone whose center was directly north of the station. In a few other cases it was noticed that relatively high easterly winds (By the term "easterly winds" is meant winds from any point between north and east) prevailed when the centre of the anti-cyclone was near to and north by east of the station.

An exceedingly interesting kite flight which sustains the view that occasionally easterly winds prevail to great altitudes, was made at the Blue Hill Observatory on June 19th 1900, (Annals of the Astronomical Observatory of Harvard College, Vol. XLIII—Part III, page 193). In this flight east-northeast winds prevailed from the earth's surface to an altitude of 13,815 feet, (4,211 m.). The winds at that elevation clearly formed a part of the circulation between a strong high that was central in the Lake region, and a low off the south Atlantic coast. These examples represent an extreme rather than a mean condition, nevertheless, they form an important exception to the general statement that easterly winds are shallow.

The wind at Mt. Weather shifts to a westerly quarter on the passage of a low over the station. The altitude of the westerly currents is very much greater than that of the easterly and the velocity is greater. Twelve ascents were made during the summer in which altitudes of two miles and over, (3 km.) were reached.

In three of these ascents the wind had a southerly component at the highest elevation reached; in each of the three ascents a marked barometric depression covered the northeastern States with lowest pressure over the mouth of the St. Lawrence River. In two other cases very high altitudes were reached with a different distribution of pressure, viz: a great trough of low barometer in the Mississippi Valley with strong areas of high pressure on both sides. In both of these cases there was a southerly component in the wind direction aloft. In the remaining cases the winds were west-northwest or west, or in the direction of the prevailing winds in the cirrus cloud level. While it seems probable that the winds up to at least two miles above the earth's surface respond to the barometric gradients observed below, it is by no means certain that such is the case. This subject needs further elucidation.

A knowledge of the vertical temperature distribution in highs and lows, obtained through kite flights, has afforded valuable information at times. The following general conclusions are drawn from the data thus far collected: 1. The air column in the low is warmer than in the high for such altitudes as were reached by the kites. 2. The region of greatest cold is found in the southeastern quadrant of the high. 3. As the center of the high crosses the meridian of the station and passes to the eastward the temperature conditions aloft become more or less unstable, inversions take place and the rate of decrease of temperature with increase of altitude diminishes.

Occasionally in the kite flight layers of air are met having temperatures higher than those found in layers of less altitude; in other words the vertical gradient is interrupted and instead of a fall in temperature with increase in altitude, a rise is found. Such breaks in the continuity of the vertical temperature gradient are known as inversions.

Temperature inversions may be classed as follows: First, those which occur in the rear of a low or on the immediate eastern front of a high. Inversions in this region are thought to be due to the circumstance that the warm surface layers of the low feeling the cooling effect of the high a little sooner than the layers at some distance aloft. This assumption follows the suggestion of Mr. H. Helm Clayton, of the Blue Hill Observatory, viz.: that

the cold air of the northern portion of the high moves more rapidly east-southeast, than does the high itself, and that on account of its greater specific weight as compared with that of the air into which it is moving, it sinks toward the earth's surface in an inclined stratum which reaches the earth's surface in the rear of the low. This type of inversion has little or no significance to the forecaster, since, ordinarily, the cooling in the rear of the low proceeds until the upper layers, within the limits of observation, at least, acquire a temperature nearly such as is required by the adiabatic rate of cooling for dry air.

A second type of inversion is met when the kites pass from one current of air into another having a different temperature. The existence of a current of warm flowing along and above a colder one is revealed in this way. Inversions of this nature afford early indications of warmer conditions at the surface.

While the foregoing covers, in brief, the most important considerations suggested by the summer's experience it does not purport to exhaust the subject in its various aspects. With the addition of the humidity element to the kite observations and the accumulation of data for the cold season it is expected that our present knowledge of the relations which subsist between air conditions aloft and at the surface, respectively, will be greatly increased. With such increase better forecasts will naturally follow.

Washington. D. C., October 23, 1907.

THE POSSIBILITY OF EXTENDING OUR KNOWLEDGE OF THE SUN AND OF ATMOSPHERIC ABSORPTION.

Prof. W. J. Humphreys, Director Mt. Weather Observatory.

It is desirable and possible by the use of sounding balloons to extend our knowledge of the absorption of the atmosphere and of the structure of the sun.

Meteorological conditions of the earth are determined in great measure by the amount and kind of energy reaching us from the sun. When the white solar light is split up into its components, it is found to consist of light that affects the eye, the red, green, blue and other colors, and a kind of light which affects the photographic plate, not visible, known as the ultra-violet, and, also, but at the other end of the spectrum, an extensive region known as ultra-red, likewise invisible. The ultra-violet light, as we know from experiments in the laboratory, has an important ionising property. The ultra-violet light, however, from the sun, that reaches the earth, does not extend very far below the visible, not nearly so far as we find it in the case of the electric arc. Presumably this is due to the absorption of the violet light in the earth's atmosphere.

The kind of light that we get from any source depends upon two things, namely; first, the light produced by the source itself; and, second, the absorption of the media through which it passes. In the case of the solar light there are two absorbing media, the sun's atmosphere and the earth's atmosphere. If the ultra-violet light is absorbed by the sun's atmosphere, then clearly it cannot be absorbed by the earth's atmosphere. It is not there to be absorbed. And, therefore, no ionising from that source could be expected. But if it is not absorbed by the sun's atmosphere, then clearly it is absorbed by the earth's atmosphere, because it does not reach the earth's surface, and ionising must take place from that source. If the air is filled with electroms we must have a different result in storms from the results we would have

when the air is not so filled. But does the air get this ultra-violet light? We would say, probably so; for presumably the sun must be sending it out, but we do not know certainly, since, as just explained, the light we get depends upon the source and upon the media through which it passes. If the sun's atmosphere absorbs it, none reaches the earth. If the sun does not, then it reaches the earth's atmosphere, but it does not get down to the earth, to the land; it stops off very far short of the limit to which a photographic plate would show it. Does that ultra-violet light leave the sun at all? Is there ultra-volet light laying about in the upper regions of the atmosphere? If so, it must do work.

We want to know the facts, and one of the ways to find out is to send up a properly constructed spectroscope attached to a sounding balloon. We may fail fifty times, but if we succeed once, that is all that is necessary. Send up the proper instrument, one that will spread out the spectrum and photograph it. Suppose we find no increase in the ultra-violet light high up in the earth's atmosphere, then we will know that the electrification of the atmosphere is not due to the far ultra-violet radiation. I fancy however the chances are that the higher up we go the less the absorption and that we will find the ultra-violet light growing, but I do not know. Establish the facts. If we find the light is not there, we will be extending our knowledge of the sun's atmosphere. That is a little line of work that is quite possible simply by attaching existing apparatus to sounding balloons. Let us try over and over until we have success, for we have everything in hand now to try the experiment. What we wish to know is what are the facts in the case. Let us attach the proper instrument to sounding balloons, that is, a properly constructed spectroscope, which with few or with many trials will some time or other give us the desired information. If this is done it certainly will extend our knowledge both of the sun's and of the earth's atmosphere and place our hypotheses on a sound basis. We will not be guessing; we will be knowing. This will allow us then to base our theories in regard to the ionising of the atmosphere upon certain definitely established facts so that we will have a sure basis to go upon.

A Panhard motor, 8 cylinder, air cooled, 50 h.p., weight 150 pounds, is being built for the English Government dirigible.

J. F. Scott has cancelled his contract to supply the Government with an hour-flight aeroplane for $1,000.

In the balloon race of April 5 of the Aeronautique Club de France 6 balloons started.

M. Brazier, the manufacturer of the Brazier car, is now studying up on aviation motors.

A. B. Lambert, of the Aero Club of St. Louis, has made half a dozen balloon trips during the month from Paris, in company with Messrs. Frank S. Lahm, E. W. Mix, Alfred Leblanc and M. Barbotte.

The helicopter system seems to be attracting inventors. The crack cyclist Jacquelin is reported to have started work and will use a 6-cylinder motor, with 2 cylinders on each side set "V," with the other 2 cylinders vertical in the center.

With a view always for the good in the motor line, a certain member of the Aero Club stopped on Broadway the other day to inspect two motorcycles which stood, with their riders, near the curb. One was a Curtiss and the other a ———.

"How do you like the Curtiss motorcycle?" I asked. "I wouldn't ride anything else—rather have it than two ———s," was the reply. "Doesn't it give you any trouble?" "No, I am absolutely satisfied."

APRIL ASCENSIONS.

Washington Times

FROM LEFT TO RIGHT: RALPH A. COLLINS (WASHINGTON TIMES), LIEUT. FRANK P. LAHM, CAPT. R. O. VAN HORN, CAPT. CHAS. DE F. CHANDLER.

April 4. F. S. Lahm (Aero Club of America) and A. B. Lambert (Aero Club of St. Louis), in the "Katherine Hamilton," 800 cbm., from St. Cloud to Tournan (Seine-et-Marne).

April 6. Captain Chas. De F. Chandler (Aero Club of America), Major Edgar Russell and Mr. C. H. Caudy in the "Signal Corps No. 10" from Washington at 1:10 p. m., landing ¾ mile N.N.E. of North Keys, Md., at 3:50 p. m. Distance, 16.25 miles; elapsed time, 2 hours, 40 minutes; average speed, 6 miles; general direction, S. 47° E.; highest altitude, 1750 m., about top of haze and dust layer.

April 10. A. Holland Forbes (Aero Club of America) and N. H. Arnold (North

Adams Aero Club) in the Stevens balloon "North Adams No. 1" from North Adams at 3 a. m., landing at Athol, Mass., 6:50 a. m. The average speed was low, travelling only 5 miles in the last hour of the trip. This trip was the "night trip" needed to comply with the requirements for a pilot's license. Distance travelled, 48 miles; elapsed time, 3 hours, 50 minutes; average speed, 12.5 miles; general direction, east.

Washington Times

LIEUT. T. SELFRIDGE AND DR. ALEXANDER GRAHAM BELL.

April 17. Lieut. Frank P. Lahm (Aero Club of America), Captain R. O. Van Horn, Lieut. T. Selfridge (A. C. A.) and R. A. Collins in the "Signal Corps No. 10," from Washington, D. C., at 2:17 p. m., for the purpose of making an experiment with homing pigeons. The landing was at Roland Park, north of Baltimore, at 6:05. Distance, 37 miles; general direction, N., N.E., N.; elapsed time, 3 hours, 48 minutes; average speed, 9.7 miles; highest altitude, 1500 meters. Seven pigeons were released, one at 5:35 and the other six at 5:45. Two of the pigeons returned to Washington by the following evening. The failure of the others to return is attributed to their being released just before dark.

April 17. A. Holland Forbes, Alan R. Hawley and Wm. F. Whitehouse (Aero Club of America—all) in the "North Adams No. 1" from North Adams at 9:25 a. m., landing at West Deerfield, Mass., 4 miles from Greenfield, at 11:45 a. m. They reported "travelled all directions from south to north." Distance, 28 miles; elapsed time, 2 hours, 20 minutes; average speed, 12 miles; general direction, east.

April 22. Captain Chas. De F. Chandler (Aero Club of America), Theodore Roosevelt, Jr., and Captain Fitzhugh Lee, in the Stevens built "Signal Corps No. 10," of 2000 cbm., from Washington at 1:45 p. m., landing at 5:20 p. m. 1½ miles east of Red Lion, Delaware. Distance, 87.88 miles; elapsed time, 3 hours, 35 minutes; average

LANDING AT 64 MILES PER HOUR TRIP OF WM. F. WHITEHOUSE AND A. LEO STEVENS ON MARCH 11, NEAR HAMPTON BEACH, N. H.

speed, 25.1 miles; general direction, northeast. Chesapeake Bay was crossed in this flight.

April 24. A. Holland Forbes (Aero Club of America), N. H. Arnold and Dr. R. M. Randall (North Adams Aero Club), in the "North Adams No. 1" at 9:20 a. m., landing 1 mile south of South Williamstown, Mass., at 11:50 a. m. Distance, 8 miles; elapsed time, 2 hours, 30 minutes; average speed, 3.2 miles; general direction, southwest.

This is the tenth trip for Mr. Forbes and he obtained his pilot's license on April 27. This is Mr. Arnold's sixth trip. Mr. Stevens' "school" graduates its pupils rapidly.

Washington Times

CAPTAIN CHANDLER AND LIEUTENANT LAHM.

A new aero club may possibly be formed in Salem, Ohio. A. Leo Stevens will shortly go there with a balloon.

"Arms and the Man," a military weekly paper which is devoting considerable attention to military aeronautics, has moved from New York, and is now located at 1502 H Street, N. W., Washington, D. C.

"Oh, Mr. Simmons," gushed one of the fair guests, "didn't it seem frightful to you to be away up in the air, going farther and farther from the earth, as if you were an independent body in space?"

"Why, no, Mrs. Jymes," said the aeronaut; "it wasn't so awfully terrifying. In a balloon you don't seem to be going up. The earth appears to be going away from you, don't you know, while you are standing still."

"But to see the horizon receding away from you——"

"Pardon me, Mrs. Jymes, but the horizon doesn't seem to recede. It seems to rise up, like the rim of a great soup bowl, and the earth has a concave appearance."

"Looks like a soup bowl? How odd! Still, doesn't it excite one's deepest emotions, Mr. Simmons?"

"Well, you can't help thinking that if anything should happen to the balloon you'd mighty soon be in the soup."—Chicago Tribune.

ON THE USE OF LIQUID HYDROGEN AND HYDROGEN-CONTAINING COMPOUNDS IN LONG DISTANCE BALLOON FLIGHTS.

In Three Parts—Part III.

By Darwin Lyon

As stated in the preceding number of **Aeronautics**, it is difficult to calculate the rate of evaporation of liquid hydrogen by comparing it with the rate of evaporation of liquid air, because of the many factors that have to be taken into consideration. In the first place, liquid air itself has no difinite rate of evaporation for the reason that it is really a mixture of two liquids having different boiling points—liquid nitrogen and liquid oxygen—the former boiling at minus 194.4° Centigrade, the latter at 182.7° Centigrade. Thus the result is that the composition of "liquid air" starts to change from the moment of its production and continues to do so until it has entirely disappeared—the mixture growing steadily richer in oxygen. We find in practice that after about four-fifths of the liquid air has evaporated, the remainder contains about 50 per cent. or oxygen.

Liquid hydrogen has a boiling point of minus 253° Centigrade, a critical temperature of minus 234° Centigrade, a critical pressure of 20 atmospheres, a specific heat of 6, and a latent heat of evaporation of 190 units. These are the physical constants of hydrogen and are used in all such problems as calculating its relative rate of evaporation.

Roughly speaking we may say that of two liquids having different temperatures and standing in similar receptacles, the rate of evaporation is proportionate to the difference in temperature between the two. Now as a general rule we may say that the rate of evaporation is inversely proportionate to the latent heat, i.e., if the latent heat of one fluid is twice that of another it will take twice as long to evaporate. **Latent heat** is potential energy in the form of a change in the internal constitution of a substance and does not manifest its presence by rise of temperature. Thus a liquid absorbs heat when it vaporizes though the temperature is not affected. When heat disappears from a substance, molecular kinetic energy is transformed into the potential form; when it reappears, the reverse transformation takes place. This molecular kinetic energy affects temperature and for this reason it is called **sensible heat.** The molecular potential energy does not effect temperature and is therefore called **latent heat.** That part of the added heat that is used to increase the rapidity of the molecular motions is known as kinetic and appears as sensible heat. That part that is used to oppose cohesion and to overcome pressure becomes potential, and disappears as latent heat. When liquid hydrogen evaporates, the potential energy needed to establish the aeriform condition is obtained by the transformation of kinetic energy and therefore at its expense;—hence, the disappearance of sensible heat or the fall of temperature. Thus we see that were liquid hydrogen not evaporating, not only would it not "produce" cold, but it itself would not be cold. When steam is condensed, the potential energy that is no longer needed to keep the H_2O in the gaseous state is changed into kinetic energy; hence, the increase of sensible heat, i.e., of temperature. The terms **latent heat** and **sensible** heat should not be confused with **specific heat.** The **specific heat** of a substance is the ratio between the amount of heat required to raise the temperature of any weight of that substance one degree, and the amount of heat required to raise the temperature of the same weight of water one degree. **Hydrogen gas** has a higher specific heat than any other substance. **Water** comes next—thus more energy is required to raise the temperature of a pound of water one degree than for a pound of any other substance except hydrogen gas. By comparing the specific heats given below it can be seen how high hydrogen stands on the scale:—Liquid hydrogen, 6; hydrogen gas, 3.409; water, 1; ice, 0.505; steam, 0.48; oxygen, 0.2175; iron, 0.1138; lead, 0.0314.

We above said that of two liquids standing in similar receptacles, the rate of evaporation was proportionate to the difference in temperature—also, that evaporation was inversely proportionate to the latent heat. "Roughly speaking," we said for the reason that in practice the statement does not hold exactly true for all liquids. The nature (e.g., double or triple, silvered or non-silvered) and shape of the bulb affects the rate of evaporation of one liquid more than another—aside from that calculated from the physical constants. For example the convection currents in the gas above the liquid differ greatly with the kind of receptacle used; and the fact that the gas given off by the evaporating liquid tends to keep cold the neck of the flask and thereby influences the conduction of heat through the inner glass wall, introduces a difficult

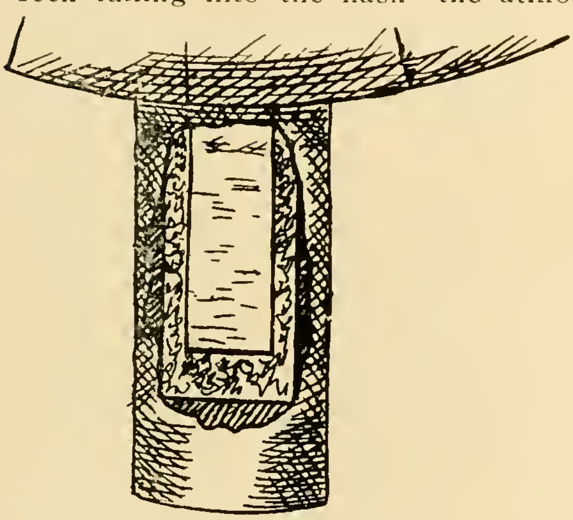
factor in the computation. The best way to reduce the rate of evaporation of liquid hydrogen is to keep it in triple-walled Dewar bulbs surrounded by liquid air—the latter being contained in a vacuum vessel or in a "Tripler bucket." When kept in this way the liquid hydrogen evaporates only about as rapidly as does liquid air when kept in an ordinary Dewar bulb. Compared with an equal volume of liquid air it requires only one-fifth the quantity of heat for vaporization. Its specific heat, however, is ten times that of liquid air or five times that of water.

Using a triple-walled Dewar bulb in good condition liquid hydrogen is in practice found to evaporate about twice as fast as liquid air. With a first class Dewar bulb, well silvered and wrapped in felt, a liter of liquid air can be made to last over two days. Five gallons can be made to last over a week. A liter of liquid hydrogen, under the same conditions, lasts about a day.

We have not as yet described liquid hydrogen and it may be as convenient to do so here as elsewhere.

Liquid hydrogen, when pure, is a colorless, transparent liquid with a well defined surface. Its surface tension is only one thirty-fifth that of water, or about one-fifth that of liquid air. It drops well and can be easily poured from one vessel to another. It does not conduct electricity, but on the contrary is slightly diamagnetic. Its coefficient of expansion is remarkable, being about ten times that of hydrogen gas, or five times greater than that of liquid oxygen. As mentioned in the preceding installment, its specific gravity is only 0.07 or 1/14th that of water, thus being by far the lightest liquid known to exist. Naturally this is very convenient for the aeronaut.

The small density of the liquid can easily be shown by dropping into it small pieces of cork, which sink immediately to the bottom. About the only solid that will float on it is pith. Its small specific gravity explains the rapidity with which the liquid is cleared on the entrance of air snow. This "air snow," or solid air, may readily be seen by removing for a few moments the cotton-wool stopper with which the mouth of the flask is closed. When this is done a miniature "snow storm" of solid air will be seen falling into the flask—the atmosphere being actually frozen where it comes in contact with the extremely cold vapor rising from the liquid hydrogen. This solid air sinks in the liquid hydrogen and accumulates as a pure white "snow" on the bottom of the flask.



TRIPLER BUCKET, CONTAINING LIQUID HYDROGEN ATTACHED IN THE NECK OF A BALLOON.

The specific heat of liquid hydrogen is very high, being nearly 6. Its latent heat is about 190 units. The high specific heat is in marked contrast with that of liquid oxygen, which is only ½. Hydrogen at ordinary temperatures is about 14 times lighter than air—Liquid hydrogen is 14 times lighter than water, and, the vapor of the hydrogen gas as it arises from the liquid is nearly 14 times heavier than hydrogen at ordinary temperatures—i.e., it is of nearly the same density as air.

A triple-walled Dewar bulb of 2 gallons' capacity weighs a little over three pounds. To be sure, this is not much; but the lightest possible wrapping or receptacle for the bulb would weigh probably twice as much again. Partly, for this reason, but more because of the rather great cost of the bulbs and their great fragility, unless well protected, it is just possible that a metal receptacle well wrapped in felt or eider-down, would better answer our purpose.

Tripler, when transporting liquid air, dispensed altogether with vacuum bulbs, and merely used cylindrical tin-buckets well wrapped with boiler felt and the whole enclosed in another bucket. The plan of one of these buckets is shown in the accompanying diagram. It will be noticed that the inner bucket is considerably smaller than the outer one, thereby allowing plenty of room for the felt wrapping. The principle of the Tripler bucket may be stated as follows: Air that is absolutely quiet is very nearly as good a heat insulator as is a vacuum. The trouble is that air cannot be kept quiescent; convection currents persist in forming and "heat" is thereby carried along. The great superiority of a good Dewar bulb over one containing a small amount of air in the "vacuum space," is alone due to this. A Dewar bulb that has not been exhausted retards evaporation to a greater degree than an ordinary vessel, for the enclosed air acts to some extent as an insulator altho considerable heat is carried by convection; but when the air is exhausted these convection currents naturally cease to exist and then the only way by which heat can be directly conducted is through the neck of the

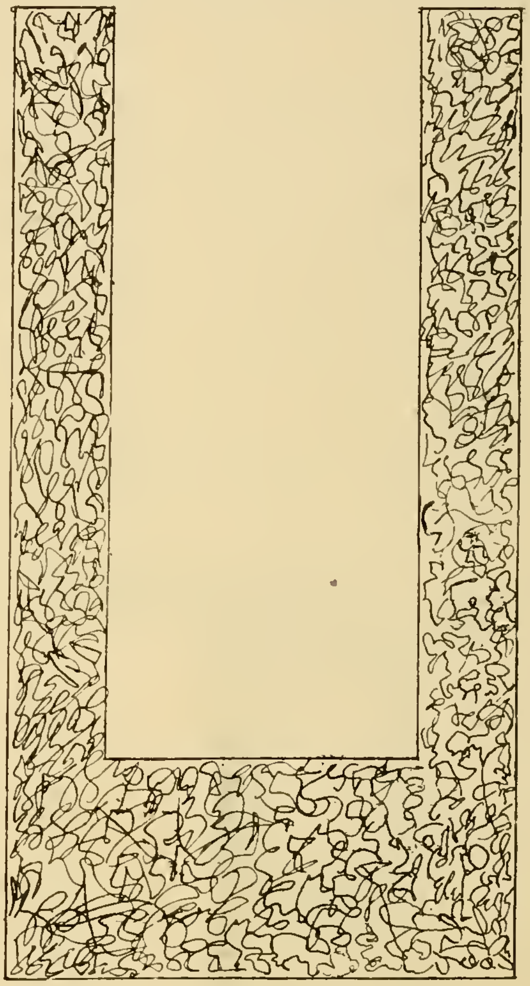
flask where the outer and inner vessels join. Thus Tripler, by packing the space between the two tin buckets, prevented the formation of convection currents, and by using boiler felt as the packing material, prevented directed conduction to a great extent—felt being a very poor conductor of heat. Experiments have proven that eider-down is superior to felt as a non-heat conductor, and no doubt a still better material could be found. In my own case I found that a flask well wrapped in eider-down acted nearly as good as an ordinary non-silvered Dewar bulb. Tripler frequently shipped several gallons of liquid air hundreds of miles in his "buckets" with a much smaller loss by evaporation than would be at first suspected.

Owing, however, to the fact that liquid hydrogen evaporates with a greater rapidity than liquid air, the only condition under which a Tripler bucket would be advisable would be when a very great quantity of liquid hydrogen was to be carried—say 20 gallons.

To make a Dewar bulb of this size would be extremely difficult.

In the diagram below, we show a Tripler bucket might be suspended in the neck of the balloon, thereby not only relieving the basket, but assuring it a safer place—the necessity for running a tube from the bucket to the balloon would also thereby be obviated.

The length of time a volume of liquid hydrogen will last is not directly proportionate to its volume. The larger the containing vessel, the less **in proportion** will be the loss by evaporation. The surfaces of solids of the same shape vary with the squares of their linear dimensions. Thus, if we have two Tripler buckets identical in shape and construction but one twice as high as the other, the internal surface of the inner bucket and of the open top will be four times as great in the one as in the other. But **volume** varies as the **cube** of the linear dimensions; so that in the case cited, the larger bucket will hold **eight** times as much liquid hydrogen as will the smaller bucket. Therefore, if we state the relation of surface to volume in the small bucket as a.b., the ratio in the large one will be 4a, 8b. If one bucket was **three** times larger than the other the ratio would be still more favorable—9a, 27b.



SECTIONAL VIEW OF A TRIPLER BUCKET USED FOR TRANSPORTING LIQUID AIR.

Col. J. L. B. Templar, Superintendent of the English Government balloon factory at Aldershot, has retired. Col. Templar has had long experience with matters aeronautical and has been foremost in encouraging the use of the balloon in warfare. His first balloon ascents were made with a pupil of the famous Coxwell. In 1877 he brought to the attention of the War Department the possibility of the application of the balloon to military use, and has since been connected with the aeronautical branch of the Army.

Among the queer things printed nowadays which, it is claimed, bear relation to aeronautics, is the following from a French daily:

"Duels in Balloons.—In the list of fantastic duels appears two duelists who both died as a result of their encounter. The reason for the conflict was a question of preponderance in the affections of a young blond beauty, Miss Dulamare. The two American suitors could not agree on the subject of the controversy and they resolved to resort to arms and it was decided that the duel take place in the basket of a balloon. Thus it happened. The combat occurred at an altitude of 2,000 meters above the Lake des Eslaves in the valley of the Mackenzie. The balloon which carried the two adversaries landed in the water and both perished. It was not without a precedent. In France, it would seem that a similar encounter took place about a hundred years ago. But may not this be a canard or the imagination of the journalist of the time in France and in America?"

AERO CLUB OF NEW ENGLAND.

The Aero Club of New England held its first dinner at the Boston City Club on May 2nd. At the dinner the future activity and policy of the Club was discussed by the members present. Among those in attendance were the President, Prof. A. Lawrence Rotch of the Blue Hill Observatory; Prof. William H. Pickering of Harvard University; Prof. J. E. Wolff of Harvard University; Mr. Henry Howard of Boston; Mr. Emil Camus, Mr. William Harris, Mr. William Whittlesey, Mr. James H. Means, Mr. H. H. Clayton of Blue Hill Observatory; Mr. Sterling Eliot, Mr. C. E. Hellier, Mr. Charles Coules, Mr. Alfred R. Shrigley, the Secetary and Attorney of the Club.

The idea of securing a flying machine from France was discussed very thoroughly, the idea having been advanced by Mr. Henry Howard, who said in part: "This country is following to-day the same short-sighted policy with regard to aerial navigation as it followed with the automobile. When we first began to think seriously of automobiles, we should have brought over one of the most perfected French machines, buying its patent if necessary. Instead, we began from the beginning and developed all sorts of freak machines. To-day we are four or five years behind where we ought to be with the automobile. We are taking the same blind attitude to-day with the air machine. We ought to buy a French flying machine and let our inventors get an inspiration by seeing it fly in this country. If we could secure one of these machines for the Club, permission could probably be obtained to operate it upon the parade grounds at South Framingham. Such a machine would cost about $5,000, and could be delivered from France two or three months after ordering. Resort to France seems necessary because of the secrecy of the Wright Brothers here, a secrecy which is likely to be maintained by the Government when the machine it has contracted for is delivered."

Mr. H. H. Clayton doubted the advisability and wisdom of the suggestions made by Mr. Howard and endorsed the sentiment of Mr. James H. Means that a prize was the best way to stimulate interest in aeronautics. Mr. Clayton said, "I believe that offering a prize is one of the best ways of stimulating interest. I do not feel favorable to the idea of purchasing a French machine. French machines embody nothing essentially different from what has been made known by the Wright Brothers in connection with their experiments. It is a little early to import a machine from France. We ought to wait until they have been further developed. Some are inclined to forget that there are two sides to air navigation. There is always room for the balloon. It is a great mistake for a club to devote itself to one question. The aeroplane and the balloon furnish quite different sensations to the navigator. The one rushes and the other is motionless as far as the occupant knows. I would like to see the Club own its balloon for the recreation of the members. With such a car it would be possible when the wind favored to take trips between Worcester and Boston in a couple of hours. Another beauty about ballooning is that there is practically no danger. The number of accidents each year as a result of ballooning is less in proportion to the number of people indulging than is the loss of life by railroad."

Mr. Charles E. Hellier saw a great chance for the Club to develop New England mechanical ability to produce a truly practical flying machine. He said in part, "I put not long ago $5000 into a flying machine and it was a failure. It failed because the engine was not powerful enough. In order to build a flying machine that will fly, a high degree of mechanical ability is needed. That ability can be found in New England and the Club can do much to bring it out. I am convinced that the Wright Brothers have built a machine that has kept up half an hour. The limit of their flight seems to be due to the failure of the motor, which either gets hot or has trouble with the gasolene. Their machine, however, is an aeroplane, or scaling machine, and not a flying machine. If once we get money and mechanical ability together there will be little trouble about getting into the air with a real flying machine. In New England there is both the ability and the money. I do not believe that the aeroplane is or ever will be practical. They have to go at a speed of at least 40 miles an hour in order to stay up. They are exceedingly dangerous. Human intelligence can surely create a machine more powerful than the bird, a machine that will beat the air to keep itself afloat, that will be in every way under control and safe to travel in. That is the machine I am waiting to see turned out in this country."

Prof. William H. Pickering of Harvard, favored the suggestion of Mr. Howard that steps be taken to secure for the Club a French flying machine and thought that by such a method much more would be done for the waiting public than by the creation of a prize fund.

The members present voted that a committee be appointed to procure for the Club a flying machine, that said committee obtain specifications of both American and French flying machines and that the best of either country should be purchased for the Club. The committee appointed for that purpose consisted of Mr. Howard, Chairman, Prof. Pickering and Mr. Hellier. The Club also considered the purchase of a

balloon and Mr. Clayton was appointed a committee of one to procure a good balloon and to raise a subscription for that purpose.

Among the other speakers of the evening were: President, Prof. A. Lawrence Rotch, Prof. John E. Wolff and Alfred R. Shrigley.

AERO CLUB OF AMERICA.

On April 20th the members were treated to a talk by Mr. Octave Chanute, the "Father of Aviation." Announcement had been made by the Aero Club of the formation of an Aviation Section, with a well planned scheme for an experimental ground and prizes, just a few days before the Bell-Chanute-Rotch-Means $25,000 aviation prize idea was made public. The two plans being somewhat similar, and alike in the amount to be raised, brought out considerable discussion of the aid such prizes would be to the art, the division of same to the best advantage and the likelihood of securing such sums of money. The plan of the Aviation Section was to secure one hundred subscribers at $250 each, while the other plan was to secure two hundred and fifty subscribers at $100.

This journal has long been urging the offering of large cash prizes and it is with the utmost pleasure that we can chronicle active steps toward this end.

Mr. Chanute told of seeing a short flight by the Wright Brothers, terminated by a slight accident to one wing, which touched the ground in making a curve. Peter Cooper Hewitt reiterated his contention that with an increase in speed the surface of the aeroplane should be reduced. In Mr. Hewitt's hydroplane, this principle was utilized. The greater the speed the more the hydroplane rose from the water, supported by the smaller planes. Mr. Hewitt suggests a system of reefing, but he has not thought out any scheme for accomplishing this mechanically.

Referring to the selection of grounds for trial flights and for gliding, Mr. Herring brought out the point that a ground suitable for motor machines would not be suitable for gliders, but Mr. Chanute explained a way of pulling the glider into the air, from a carriage, by a cable attached to an electric motor, as was done by him at the St. Louis Exposition.

The subject of the Government trials of the Herring and Wright Brothers machine was discussed and Mr. Herring stated that the trials would be secret. Mr. Manly humorously remarked that he had seen such "secret" trials before. We learn, however, that no plans have been made by the Government officials for any secret trials, though they might be had upon request of the inventors.

At the meeting Hon. James M. Beck proposed an aeronautic demonstration in connection with the Hendrik Hudson Memorial celebration, but no plans have yet taken shape.

In this connection we would like to suggest the election of Mr. Chanute to honorary membership. The present honorary members are: Count de la Vaulx, Lieutenant Lahm and James Gordon Bennett, representing aerostation. Count de la Vaulx was the first to be thus honored. Aerostation is sport—aviation is science. With Mr. Chanute recognized, even abroad, as the foremost figure in the aviation world it would seem proper that America should be represented among the honoraries of an American club. At the meeting, Mr. A. C. Triaca contended for due recognition for Mr. Chanute and explained that abroad he was considered the "Father of Aviation, and that all successful machines were only carrying out plans originally adopted by Mr. Chanute."

An informal dinner was tendered Mr. Chanute at the Hotel Savoy on that evening by some of the active members of the club.

On April 30th, the First Company, Signal Corps, National Guard, N. Y., listened to an illustrated lecture on aeronautics by Augustus Post, Secretary. The making ready for an inflation of a full sized balloon kindly loaned by A. Leo Stevens, was demonstrated under the direction of Lieutenant Lahm, by the Balloon Squad of the First Company, just organized, Henry Godet, 1st Lieut., commanding. A large model balloon was loaned by A. C. Triaca, Director of the International School of Aeronautics.

The following new members have been proposed:

James Means, George H. Guy, N. H. Arnold, Howard W. Gill, Clifford B. Harmon, A. W. Vorse, Morris Bokor.

NORTH ADAMS AERO CLUB.

A. Holland Forbes has presented to the Club a cup to be raced for by at least three balloons, the conditions of the race not to be decided until the day set. The morning of the race a pilot balloon will be sent up and then some town picked out in the course of the wind as an objective point. This would be most interesting and the plan is followed very often in contests in Europe.

The Berkshire Street Railway has donated $50 toward the new instruments to go

with the "North Adams No. 1" which the Club recently purchased from A. Leo Stevens.

PITTSFIELD AERO CLUB.

The Aero Club at Pittsfield has purchased a thousand meter balloon from the Stevens factory. On May 7th two sounding balloons will be sent up by Professor A. Lawrence Rotch, Director of the Blue Hill Observatory. They will be the first to be used in New England. The date is the international one arranged by various observatories in Europe and America.

MILWAUKEE AERO CLUB.

On April 29th a meeting was held in the rooms of the Merchants and Manufacturers' Association.

Major H. B. Hersey told of his experiences, Professor Warren S. Johnson spoke on the scientific side, and Mr. R. B. Brown, Engineer of the Milwaukee Gas Company, discussed arrangements for inflation for a proposed balloon contest. R. B. Watrous, Secretary of the Club, also addressed the meeting.

APRIL ARMY NOTES.

Charles De F. Chandler, Captain U. S. Signal Corps, left Washington the first of May for Fort Omaha, where the buildings for the aeronautic park are nearing completion. It is expected that Lieutenant Frank P. Lahm will then be placed in charge of the Aeronautical Division of the Signal Office.

Proposals were opened on April 29th for a 1,000-cubic-meter balloon for free ascensions and a 540-cubic-meter balloon for captive work. Award was made to Captain T. S. Baldwin, the lowest bidder, on May 7.

Advertisements are being sent out for a tent for housing the dirigible balloon now being built for the Signal Corps by Captain Baldwin. This tent will be erected at Fort Myer.

Captain Chandler has been relieved from duty at Washington and has left for Fort Omaha, Neb., where he will take charge of the aeronautical plant. Lieutenant Frank P. Lahm has been detailed to succeed him in charge of the Aeronautical Division.

Lieutenant Thomas Selfridge, Secretary of the Aerial Experiment Association, now at Hammondsport, N. Y., has been assigned to duty with the Signal Corps for aeronautical work and will be ordered to Washington later.

NEW BOOKS.

DIE AEROPLANE UND LUFTSCHRAUBEN, der statischen und dynamischen Luftschiffahrt schwerer und leichter als Luft, von Dr. Wegner-Dallwitz. Small 8vo., paper, 45 pp., Illustrated with 7 diagrams. Contents-Teil I; Die Aeroplane, Die Tragschraube, Die Treibschrauben, Der Motor. Teil II; Allgemeine Luftdruckgleichung, Anwendung auf die Berechnung der Aeroplane, Die Beanspruchung des Aeroplans, Die Detriebskraft der Schwebeflieger, Die Betriebskraft der Motorballoons. Was verstehen wir unter der Fluggeschwindigkeit V, Die Tragkraft der Aeroplane, Der Handflieger, Der Aeroplan als Steuer, Der Tragschrauben, Die Tragkraft und die Betriebskraft der Tragschrauben, Die Beanspruchung bei den Tragschrauben, Die Treibschrauben, Die Treibschrauben, Die Treibkraft und die Betriebskraft der Treibschraube, Die Beanspruchung der Treibschraube. Published by C. J. E. Volckmann Nachf., Inh. Ernst Wette, Rostock i. M., Germany.

AERIAL FLIGHT: AERODYNAMICS. Vol 1. By F. W. Lanchester. 8vo., cloth, 442 pages, 162 illustrations. Published by D. Van Nostrand Co., New York, at $6.00. **Sold by Aeronautics.**

Among the recent books dealing with the technique of heavier than air apparatus is one of extraordinary interest and scope. "Aerodynamics" by F. W. Lanchester, takes up the study of air phenomena and starting with the analogies of fluid resistance gradually works up a set of formulae and coefficients for unknown values which permits the mathematical treatment of the subject in some instances from a new point of view. The deductions drawn from time to time bear the stamp of probability and

for the most part agree with the testimony written and all of the few authorities available in this portion of the field of scientific research. The paucity of elementary data is commented upon by the author as preventing in some cases the arrival at conclusions sufficiently exact to be of the greatest advantage, which undoubtedly explains the fact that where these formulae are applied in actual design such as described in section 218, considerably higher efficiencies are attained in practice with the screw propeller.

The use of several new words such as "Aerofoil," to stand for any shaped surface used in the accepted sense of an aeroplane, as a more exact term may win its way into favor, although in the general mind the conception of an aeroplane has ceased to be confined to absolutely flat surfaces.

The reasoning in connection with drift or edge resistance air vortices, and stream line construction seem well borne out in practice, while it remains to be proven that the difference between the laws of aerodynamics and hydrodynamics is not greater than appears on the surface.

The general treatment of the experimental data of Langley, Dines, and the author brings out several new thoughts that will well repay a careful reading of the book.

WILBUR R. KIMBALL.

LUFTREISEN: von Prof. Johannes Poeschel, published by Fr. Wilh. Grunow in Leipsiz, price 6 Mark. A new and interesting balloon book. Illustrated with photographs and diagrams.

Kein Tag vergeht mehr, ohne das uns die Zeitungen von neuen Ereignissen und Erfolgen auf diesem Gebiete zu berichten hätten. Alles was sie mitteilen, wird mit Spannung gelesen und in allen Kreisen lebhaft besprochen. — So dürfen auch die hier gebotnen Berichte über Ballonfahrten wohl das Interesse vieler auf sich lenken.

Der Verfasser ist kein Berufsluftschiffer, sondern ein Mann, dessen Lebensarbeit von der Luftschiffahrt weit abzuliegen scheint. Beinahe fünfzigjährig bestieg er zum erstenmal den Ballonkorb, da aber hat es ihn gepackt und wird ihn nicht wieder loslassen, solange die nötige körperliche Frische bei ihm noch vorhält. Wieviel hat er doch der Beschäftigung mit Luftschiffahrt zu danken. Sie hat ihm auser unvergleichlichem GenuB auch eine Fülle geistiger Anregungen gegeben. Vor allem verdient es die "Laiengeographie im Ballon," wie man sie nennen möchte, von dem Luftreisenden, den nicht bestimmte andre Gründe zum Auffrahren veranlassen, beachtet und gepflegt zu werden, ihr namentlich hat auch der Verfasser sich zugewendet. Freilich sind es erst wenige Fahrten, die er bis zum Abschlus dieser Schrift unternommen hat, immerhin hat er auf den fünfzehn Reisen bei einem Gasverbrauch von 15.400 Kubikmetern 4918 Kilometer zurückgelegt und Deutschland fast nach allen Richtungen, auch ein gut Stück Ausland überflogen. Möchte das Buch dazu beitragen, alle aufzuklären und zu bekehren, die in der Luftschifferei noch immer nichts weiter als einen müsigen und gefährlichen Sport erblicken, möchte es ihr neue Freunde und Anhänger gewinnen zu deren eigner Befriedigung und Freunde.

Das Buch ist eine der interessantesten Erscheinungen des Jahres. Die Beigabe auf den verschiednen Fahrten aufgenommener Bilder sowie einiger Karten verleiht dem Buche noch einen besondern Wert.

The sculptor-aviator Delagrange has cast a bust of Henri Deutsch de la Meurthe.

The "Ville de Paris" has been inflated again and flights will be resumed under military direction.

Some months ago, M. Charron and M. Santos Dumont made a bet, The Brazilian aeronaut wagering that within six months he would attain a speed of a hundred kilometers an hour with his hydroplane, his own invention. Santos Dumont having lost, he has just sent M. Charron a check. The winner forwarded the 1000 francs to the Aero Club as a prize for the encouragement of aviation.

Carl E. Myers, of the "Balloon Farm," Frankfort, N. Y., has just shipped two sounding balloons to the U. S. Weather Observatory at Mount Weather. This is the only station in the United States Weather Bureau using small captive balloons and the two just sent are the first of the kind the Bureau has had. They are used to supplement the kites, on days when there is not wind enough to take the kites up. In the last nine months only five such days have occurred. It is hoped to get an altitude of from 5,000 to 10,000 feet with them, depending upon conditions, wind, etc., aloft. Such altitudes are obtained abroad with similar balloons.

The Wright Brothers Sell Their Aeroplane (?).

It is reported abroad that the Messrs. Wright have sold their patents to M. Lazare Weiller, a wealthy Jewish banker of Paris, for $100,000, conditional upon flying a specified distance at a speed of 50 kilometers an hour. How true this report is, there is no means of saying. At least, it must be doubted, we believe.

New Machines in Course of Construction.

F. E. Boland, of Newark, is building an aeroplane which will be finished in about two weeks.

Wilbur R. Kimball, of New York, has nearly finished his helicopter and will shortly begin trials. The motor will be a 40 horsepower Aero & Marine, water cooled.

The Aerial Experiment Association's aeroplane "Red Wing" has been rebuilt and is ready for trials.

The Rene Gasnier aeroplane is being built at his chateau du Fresne, in the district of Maine-et-Loire. The apparatus has two superposed planes of 10 meters spread and 30 square meters supporting surface. In the rear is the stabilitating plane of 3.5 square meters. A rudder is placed in front which steers laterally as well as vertically in one movement. The motor will be a 40 horsepower Antoinette. The total length is 9 meters and the weight 400 kilos.

The Kapferer-Paulhan monoplane, which has been building during the Winter, has been taken to Buc. M. Kapferer has made a few satisfying trials and will begin trial flights as soon as the weather is better. A Pelterie motor is used.

The crack cyclist Jacquelin is building an aeroplane with the carriage maker Vedrine. A 6-cylinder "W" motor of Dutheil & Chalmers will be installed.

Edouard Bourdariat is buying an aeroplane of the "Chanute" type, with 7.5 meters spread and 22.5 square meters total surface.

M. Bellocq will try at the end of May an aeroplane of his own invention, with a 50 horsepower motor.

M. Auffin-Ordt has constructed an aeroplane to be equipped with a Pelterie 40. The feature of the apparatus is an automatic equilibrium plane. Experimenting at Buc, he was satisfied with rolling along the ground for 300 to 400 meters. Everything worked perfectly, although he had to work against the wind and up hill. "It is quite certain that this apparatus will rise when the aviator will use the motor at full power."

M. Goupy has under construction a 3-superposed-plane machine. His idea is to obtain great supporting surface and diminish the spread. The motor will be a Renault 50.

The monoplane of M. Blanc made its debut on March 29th at Rouet, near Marseilles. The Pelterie motor, 35 horsepower, 45 kilos weight, worked perfectly. There are 2 two-bladed propellers of 2 meters diameter, 1.2 meter pitch. The apparatus is a two-surface, arranged "tandem." The total weight is 280 kilos. At the first trials it met with a slight accident.

Paul and Ernest Zens are constructing at Gonesse a biplane with a dihedral angle. The spread is 8.5 meters. The lower plane is 2.3 meters in depth and the upper 1.2 meters. The total carrying surface is 29.75 square meters. The rudder is in front at the end of a framework 2.5 meters long. This plane can be tilted from left to right, and serves to steer vertically and horizontally, and to be especially effectual in making turns. The apparatus weighs 300 kilos and is mounted on the usual 4-wheeled chassis. A 50-horsepower Antoinette motor will be used to actuate a single propeller 2.05 meters diameter, 1.3 meters pitch.

Zeppelin IV.

The Zeppelin IV. is nearing completion, and may be expected to make its first trials the latter end of May.

Malecot Dirigible.

The dirigible balloon built last year by M. Malecot has been removed to Issy les Moulineaux, where experiments will be conducted with it under the supervision of a special technical committee appointed by the Minister of War.

Balloon Contest at Verona.

The first aeronautical contest organized in Italy took place on March 19 at Verona. Three balloons started.

Cheap Gas.

Aeronauts are always glad to hear of places where cheap gas can be obtained, even if they cannot get that price for themselves. The gas works at Billy-Montigny, about 50 miles north of Paris, and the works at Roubaix both sell gas for 2 cents a cubic meter—$20 for a balloon the size of the "Stevens 21," 1,000 cubic meters, recently sold to the North Adams Aero Club.

Farman and the Motor Manufacturers.

Every one knows that the rivalries of motor manufacturers have caused the present deadlock. Why cannot the Count de la Vaulx get a sufficiently powerful A or B aeroplane motor? How came Vuia to offer his money in vain to the only three companies pretending to make aeroplane motors? Now he is getting one of the latest C models, like De la Vaulx—after the C people gave up hoping to interest Farman. Why, they had agreed to pay a friend of Farman's 20,000 francs if he could persuade Farman to make a deal with them!"

"Why could not De la Vaulx get an A or B motor?" I asked.

"Because Farman would not allow it. He won the Archdeacon prize with the A motor—in spite of the royal offers of the Bs and Cs. Having honestly fulfilled his engagement with the As, he was free to accept a B motor.

"Which he did.

"Now he has both, he lags and drags—and keeps them fighting over him like Lucifer and Michael over the body of Moses. Naturally, the As hope to keep the splendid advertisement. Naturally, Bs hope to get it from them; but they have not a really practical aeroplane motor yet, although they may have shortly. There's been lots of temptation to kill time."

You see, there are automobile motors and marine motors. There are even dirigible balloon motors. All are different, according to the need. And from the Paris point of view the true aeroplane motor is just being evolved; and jockeying and rivalry retard its evolution. All want Farman. If they can't get Farman, they'll take Delagrange.

Do you know the history of the Farman aeroplane? Delagrange, a Paris sculptor, thought of coupling two Wright gliders—front and tail—and putting in a motor. The Voisin brothers, engineers, made all the calculations and built the machine for Delagrange. And it flew—weakly. Farman quite new to the subject, simply ordered the Voisins to duplicate it for him, Delagrange being willing.

When he took delivery, the A motor was the only aeroplane-adapted one upon the Paris market. Moreover, Bleriot of the Voisin firm, a rich young man, owned the mass of A stock.

In force and lightness, tested on the ground, the famous mark showed magnificently. Weighing less than three pounds per horsepower, it was the first of the 8-cylinder type, without flywheel. It had no carburetor, for the sake of lightness. Thus its carburation was delicate; and at vital steering moments Farman had to turn round and let in more or less air.

It was water cooled. In a flimsy aeroplane frame, the vibrating motor would now twist a tube or pinch a joint, compromise the water cooling; or an essence tube would get a shake and the force weaken, letting Farman promptly down to earth.

Thus the motor that gave fifty horsepower in a rigid testing chassis yielded, say, but thirty horsepower in the air, some days more, some less, and Farman struggled with that motor—while the A strove to improve it. He had engaged to win the Archdeacon prize with it, and he finally succeeded on a very cold day, which prevented its habitual heating.

Meanwhile, the two other world-famed motor firms announced aeroplane motors—almost ready. That is, you could give your orders. But the first order they desired was that of Henri Farman.

How could it be otherwise?—Chicago Record-Herald.

Mechanics of the Military Dirigibles.

Four new non-commissioned officers chosen from the entire French Army have recently been assigned to the battalion of sapeurs-aerostiers (first regiment of engineers), to be detailed to the detachment that this body of troops furnishes to the central establishment of military aerostation at Chalais-Meudon. They will receive here instruction as mechanics for dirigible balloons throughout the present year, their main duty being the operation of gasoline engines. Outside of the time which they will give to manoeuvers of the dirigibles, these mechanics will be employed for the

present in the general service of the central establishment; but they can in the future be detached and stationed in certain localities where the dirigible balloons will be located. The four mechanics will be thoroughly instructed throughout the present year, and by January 1st, next, if they show proof of the requisite knowledge, they will receive the full title of aerostatic mechanics. In the course of time they can be promoted to the rank of Adjutant.

An Airship for $22.15.

Eugene Godet's airship, which was at the Jamestown Exposition, was sold on March 28 by the officials of the Norfolk customs house for $22.15. It will be remembered that an ascent was made with it and a landing in the waters of Hampton Roads.

The Wright Brothers' Motor.

The Wright Brothers, who have received from the American Government an order for an aeroplane for the War Department, have ordered motors from the factory of Barriquand and Mare (France). Points: 40 horsepower, 4 cylinder; case of aluminum; 108 bore by 100 m. m. stroke; automatic valve; make and break ignition; automatic lubrication with circulation of oil by means of a pump; another pump sends the gasolene directly into the cylinders, as in the Antoinette motor.—Exchange.

Troubles of an Aerialist.

To the Editor: Would say that P. E. McDonnell is right in regard to a hole through the earth as per his interview in the Sunday Inter Ocean. The whales from Scotland can prove it. Lord Kelvin used to pouf-pouf the assertion. Professors in this country are just the same as Lord Kelvin. Men that go North can teach them something. I ask you one question: The stones on the icebergs—where do they come from? And broken trees and branches and ferns and red berries? I have seen more than three tons of small stones and branches on an iceberg.

How did they get there? I say from the inside of the earth. They did not grow there—that is a sure thing. The inside of this earth is peopled the same as the outside. Another thing for your professors: What is the reason that all animals run north at the sight of a ship and if followed still run north? Professors ram down your throat the assertion that the sun causes the northern lights. I say not. The light from the inside of the earth is the cause of that.

McDonnell says there is not an airship in existence that will reach the north pole. He makes the mistake of his life. For thirty years an airship has been in existence which can go anywhere and do anything. It was ten years in Will county and has been ten years in Chicago. Wellman tried to get there with his gas bag. What fools these mortals be! He had a gas bag and he was a wind bag. It is my belief he was never out of Washington, D. C.

Greed for the dollar keeps aerial navigation back.

AIR SHIPS FOR WAR, FREIGHT, OR PASSENGERS, FROM CHICAGO TO THE NORTH POLE AND BACK IN FOURTEEN DAYS. OR THROUGH THE CENTER OF THE EARTH AND COME OUT OF THE SOUTH POLE IN SEVENTY DAYS. WILL CARRY 200 MEN WITH BAGGAGE.

Put the money up and I will show you that it can be done. And I will prove to you that the earth is hollow and that there are men there. There are billions of dollars lying idle right here in Chicago, but they all want something for nothing, which they will not get from me.

THE MASTER OF THE AIR.

—Chicago Inter Ocean.

Aeronautical Show in London.

From March 21 to 28, at the Cordingley automobile show, a section was devoted to aeronautics. Last year the aero show was held under the auspices of the Aero Club, and the trials of models brought exhibits which were lacking this year. (See "Aeronautics" for July, 1907.) Perhaps the principal exhibit could be called that of Messrs. Spencer, the balloon manufacturers, in which were shown models of various sized envelopes and full-sized baskets and valves to correspond. A feature was the aluminum

panelled valve. They also exhibited two airship frames, of triangular bamboo, the engine slightly forward of amidships and the car aft, the screw being direct driven from the propeller shaft. The engines are to be 24 and 12 horsepower, respectively.

A peculiar type of helicopter, full sized, was shown by Messrs. Dagnall, Mallinson and Porter, which consisted of an inverted trumpet-shaped structure inclosing a horizontal propeller near its larger and lower orifice. The machine has not yet been tested.

Various light motors were exhibited, together with various models, of which noteworthy were the flyers of Mr. T. W. K. Clarke.

The small balloon of the Hon. C. S. Rolls, calls to mind the smallest one ever built, that of Santos Dumont. The envelope was of Japanese silk and the balloon weighed, with everything complete, including anchor, 27.5 kilos. When the envelope was folded in the basket the balloon could be carried like a valise. It was called "The Brazil." 35 kilos of ballast could be taken.

Another Parseval Airship for Germany.

A new dirigible is being built by Riedinger, of Augsburg, for the Berlin Motor Airship Company along plans of Major von Parseval, and will probably approximate the present improved Parseval in many respects. It is expected to be completed in May, the first trial to take place at Reineckendorf.

The German military authorities are reported to have decided to establish an aerostatic park at Metz, and that Major Gross is at present at Metz locating a suitable place. The first airship to be stationed there will be one of 2000 c. b. m. capacity, designed by Major Gross.

It may be of interest to note the latest suspension idea of the Parseval motor balloon.

The new suspension comprises the parallel pairs of cables 1 and 2, which have the same length, and rigidly connect the middle part of the balloon with the car, as well as the oblique ropes 3 and 4 which support the projecting points of the balloon and pass

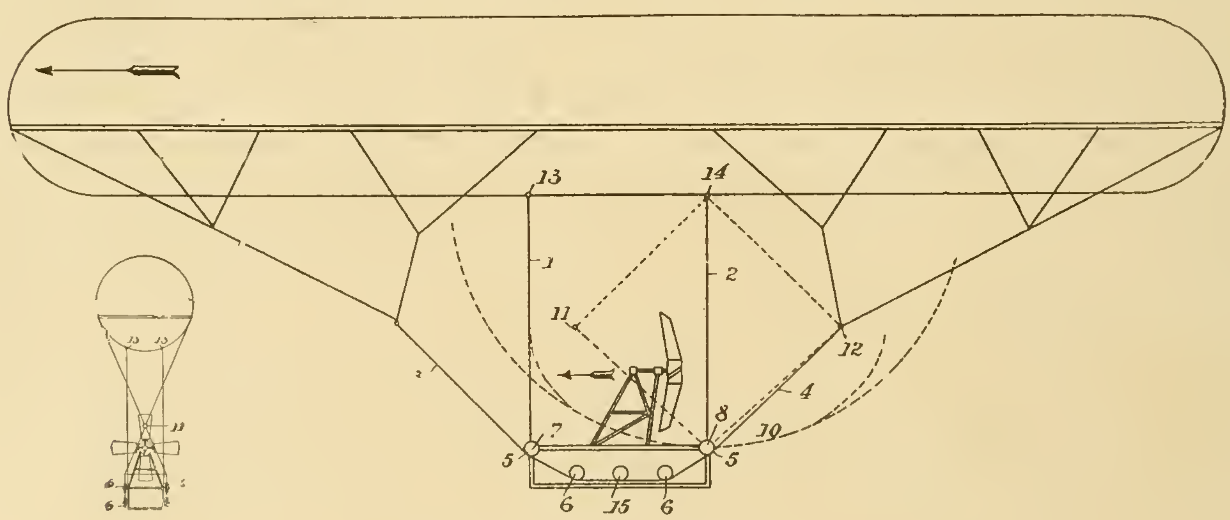


DIAGRAM OF PARSEVAL DIRIGIBLE.

at the car under gliding rollers 5 and 6. When the car oscillates it follows circular courses at the ends of the ropes 1 and 2 while sliding by means of the rollers 5 and 6 on the sliding ropes.

In order to prevent the axis of the balloon being deformed by the sliding ropes, the dimensions of the ropes are calculated in such a manner that the circular motion of the points 7 and 8 coincides within the limits 9 and 10 of the motion of the car, which are practically to be considered, with that part of the elliptical way which corresponds to the motion of the slide ropes. The foci of the ellipses are at 11 and 12.

The advantages of this suspension are the following: A long and rigid supporting framework for the car is not necessary; the screw propeller may be located between the balloon and the car, so that it is best protected against damage when landing; owing to the large distance between the motor and the balloon, any danger of explosion is excluded; the upwardly directed tilting movement of the low placed propeller screw is strongly diminished, as under the pressure of the propeller screw the car automatically advances and carries its center of gravity ahead; owing to this advancing and

following motion of the car, the pitching motions of the balloon produced by the variation of the speed are considerably reduced.

Consequently, in spite of the low position of the car, dynamic effects are obtained as if the car be suspended very high, i. e., at the height of the securing points 13 and 14 of the parallel ropes. The above described car suspension unites the advantages of a low position of the car with that of a highly positioned center of gravity of the car.

The arrangement may also be used as a rigid suspension if it is desired to control the inclined position of the balloon by shifting the center of gravity of the car. In this case the car may be held in the desired position by the sliding ropes themselves by connecting the latter with a roller 15 in such a manner that the rope is prevented from slipping on the roller. The mechanical rotation of this roller produces the shifting of the car.

The Hon. C. S. Rolls has offered a handsome silver cup, representing a balloon, to members of the Aero Club of the United Kingdom, in a "Hare and Hounds Race" during 1908. Mr. Rolls will take the part of the hare in his new small balloon "Imp" and the pilot who lands nearest to him at the final descent will be the winner.

M. Georges Besancon, Secretary of the Aero Club of France and of the F. A. I., has been honored with the cross of The Legion of Honor and is now "Chevalier."

The Aero Club of America regrets the acceptance of the resignation of Dr. Julian P. Thomas.

The hydrogen gas reservoir, which is being erected near the park of the Aero Club of France, will be ready by June 15, it is expected. The erection of the plant was announced in the March number.

The French Dirigible Balloon Company has decided to construct an aeronat of 3000 cbm., of the De la Vaulx type. Mallet will build it.

The Syndicate of Aeronautical Industries, in France, at a meeting the last of February, decided to ask the Minister of Public Works and the railroad companies for a specially reduced tariff for the transportation of balloons and apparatus for aviation.

Among the queer things printed nowadays which, it is claimed, bear relation to aeronautics, is the following from a French daily:

"Duels in Balloons.—In the list of fantastic duels appears two duellists who both died as a result of their encounter. The reason for the conflict was a question of preponderance in the affections of a young blond beauty, Miss Dulamare. The two American suitors could not agree on the subject of the controversy and they resolved to resort to arms and it was decided that the duel take place in the basket of a balloon. Thus it happened. The combat occurred at an altitude of 2000 meters above the Lake des Eslaves in the valley of the Mackenzie. The balloon which carried the two adversaries landed in the water and both perished. It was not without a precedent. In France, it would seem, that a similar encounter took place about a hundred years ago. But may not this be a canard or the imagination of the journalist of the time in France and in America?"

ANNIVERSARY NUMBER

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OF AERIAL NAVIGATION

A. Leo Stevens, Mr. and Mrs. E. C. Peebles

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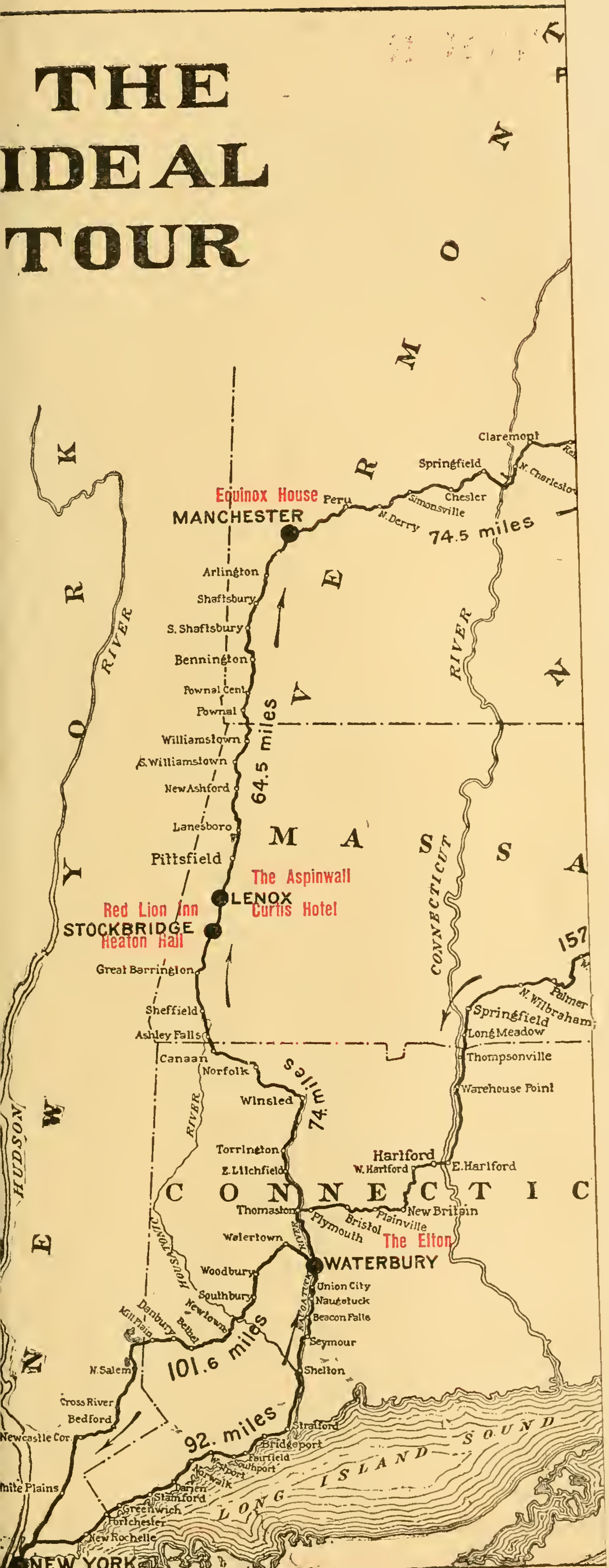
THE IDEAL TOUR



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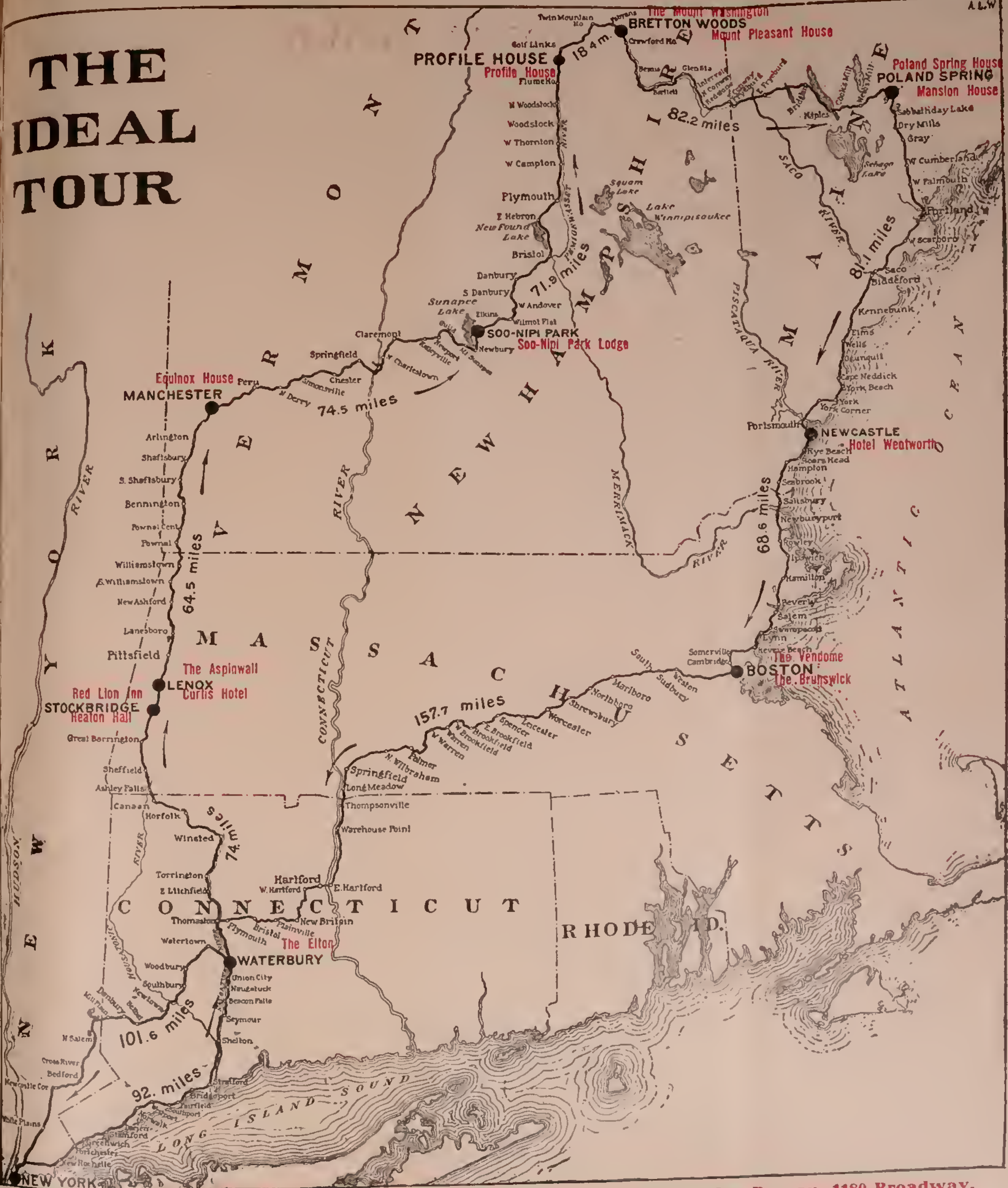

Send to any of the Hotels mentioned, or New England Resorts Information Bureau, 1180 Broadway, New York, for illustrated booklet and detailed route description.

THE IDEAL TOUR.

The Ideal Tour is the natural outcome of the demand by the touring motorist for the best route through New England, which includes the varied scenery of the mountains with the attendant panorama of stream, lake, forest, rolling farm lands, and the rugged coast of Eastern New England; with that most enjoyable feature of a motor car trip—A FIRST-CLASS HOTEL AT THE END OF EACH DAY'S RUN. The Tour can be made comfortably in ten days, or half as many weeks may be spent in exploring the many interesting sections of the country through which the tourist passes.

Leaving New York along the Boston Post Road, the many historical and interesting towns, along the way, are without doubt well known. Among them, is Greenwich, where may be seen the flight of steps down which General Putnam rode in a gallop in the days of the Revolution. Another Greenwich landmark is the old Congregational Church. Stamford was founded in 1640, and many fine specimens of Colonial architecture are still in existence; in contrast, there are many beautiful residences of modern architecture. Norwalk is another old town of historical interest. The NORWALK HOUSE, of old time coaching fame, is an excellent stopping place for Luncheon. At Stratford, the tourist leaves the shore and turns north toward the Berkshire Hills. The next few miles, the traveler passes along the banks of the picturesque Housatonic until Shelton is reached; here, the river is crossed and one enters the beautiful Naugatuck Valley. The scenic beauty of this Valley is unsurpassed on the entire route.

Waterbury, Conn., is the end of the first day's run, and here is located THE ELTON, a magnificent fire-proof hotel, opened in 1905, delightfully situated on "The Green." Waterbury is that rare combination of city beautiful and manufacturing town. Founded in 1677 and known then by the Indian name of "Mattatuck," it abounds in Colonial and Revolutionary lore, mostly of local fame.

Following the Naugatuck Valley, on the second day, one finds more beautiful scenery, through Thomaston, famous for its clock works, and Litchfield, a town of rare beauty, where the first Law School founded in this country was situated, through the rolling Berkshire foot-hills and fairly among the Berkshires at Norfolk, passing through Canaan and Great Barrington to Stockbridge, where are located HEATON HALL and RED LION INN, both well known to all tourists. The Tourist, on this day's run, may take his choice of these hotels or continue on to Lenox, where he will find THE ASPINWALL and the CURTIS HOUSE, both famous the world over. Stockbridge and Lenox are the most beautiful towns in the Berkshire region, and, in this section, are many beautiful estates. They are both places of historical interest. At Stockbridge, the site of an early Indian Mission Church is marked by a tower. These towns have been famous, in times past, as the summer homes of many famous literary men, among them, Jonathan Edwards, who was pastor of the Indian Mission Church, and left there to take up his duties as President of Princeton College; others who have spent their summers here and written many of their famous works amid these beautiful hills, were William Cullen Bryant, Oliver Wendell Holmes, Longfellow, and Hawthorne.

The third day, the tourist passes on through Pittsfield, Lanesboro, and New Ashford, where Mount Greylock towers grandly, a fore-runner of White Mountain scenery. Just beyond Greylock, is Williamstown and venerable Williams College. At Bennington is the site of the Battle of Bennington, which is suitably marked by a monument. At Manchester, the EQUINOX HOUSE, one of the oldest resort hotels in the country, but modernized and up-to-date in every way, situated at the foot of Mount Equinox, is the resting place. Here is the Ekwanok Country Club, whose golf links is acknowledged by good golfers to be one of the finest courses in the country.

On the fourth day, after crossing the Connecticut River at Springfield, Vt., New Hampshire is reached. A point of interest, on this day's trip, is the country estate of the late John Hay, Secretary of State, at Newbury. SOO-NIPI-PARK-LODGE is a new and most delightful resort house, and the Tourist who will spend the night here will be delighted with the beautiful scenery and the good accommodations. Interest is added to this point by nearness of the famous Corbin Game Preserve.

The fifth day takes one into the White Mountains through the Pemigewassett Valley, which begins at Plymouth, where the Tourist will stop for Luncheon at the PEMIGEWASSETT HOUSE, long famous as the starting point of the coaching trips into the White Mountains. Passing up the valley, the Flume House is reached, and it would well repay the Tourist to tarry here and journey on foot to visit the Flume, about one mile distant, which is one of the most interesting features of the White Mountains. Going on up through to the Franconia Notch, justly famous for its towering cliffs and magnificent scenery, the PROFILE HOUSE is reached. The old Profile House was well known to all travellers who visited the White Mountains in the past. The NEW PROFILE HOUSE was erected in 1906, on the site of the old building, and this beautiful house with its cottage colony accommodates nearly five hundred guests. Within a short distance from the hotel, is the "Old Man of the Mountains," one of the natural wonders of the world. In the opposite direction from the Hotel, is Echo Lake, one of the prettiest bits of scenery in the Mountains and noted for its echo. Also Profile Lake, known as the Old Man of the Mountains Mirror.

The sixth day is a short run to Bretton Woods, where, in the heart of the White Mountains, are located the magnificent MOUNT WASHINGTON and the home-like and comfortable MOUNT PLEASANT HOUSE. The MOUNT WASHINGTON is one of the most costly and beautiful resort hotels in the country, and has increased the fame and patronage of the White Mountains since its erection a few years ago. The Presidential Range is seen from this point in all its grandeur. The "Tip Top" House on Mount Washington and other points of interest are easily accessible from here. These places are famous from a motoring standpoint, as the finishing point of the Glidden Tour, and the starting point of the "Climb to the Clouds" of recent years.

The seventh day, or rather the seventh stage of the journey, if the Motorist has been exploring the beauties of the various stopping places, takes one down Crawford Notch between Mt. Webster and Mt. Willey; the latter is the scene of the slide which buried the Willey family many years ago. Leaving the Mountains and following the Soco River past Glen Station to North Conway, which is the southern gateway to the Mountains, and passing into Maine at Fryeburg, through Bridgton to Naples, some fine scenery along numerous lakes and ponds is enjoyable, as well as the rolling farm and wooded slopes of this part of Maine. At Poland Spring, famous the world over for its remarkable natural Spring Water, is situated the justly famous POLAND SPRING HOUSE, one of the most delightful resort houses in the country; and the MANSION HOUSE, which has been in the possession of the Ricker family for over 100 years. The Maine State Building, used as a Library and Art Building, was the "Maine Building" at Chicago World's Fair, and was removed by the owners of Poland Spring to its present location, stone by stone. A visit to Poland is not compl without an inspection of the Spring a Bottling Houses, the latter being the fin building in the world used for such p poses.

The eighth stage is through Portlan where the coast is reached. A most beau ful city,—the birth-place of Longfellow, — where numerous points of interest abou Following the rugged coast through Kenne bunk, York Beach and Wells, well know for their beautiful summer residences, to Kittery, the last town in Maine, one crosses the Piscatague River to Portsmouth famous for its Navy Yard and as a scene the Russian-Japanese Peace Conference 1905. Portsmouth has many beautiful ol houses of the period of the Revolution. At New Castle, a famous historic town near Portsmouth, is situated the HOTEL WENTWORTH, which will be found a modern a delightfully situated house, accommodati five hundred guests. This House was mu in the public eye, in 1905, as the headquarters of the Japanese and Russian Peace Commissioners.

The ninth lap, through Newburyport, Mass., Ipswich and other historical towns, including Salem, the "Witch Town" of early days, to Boston, where the Tourist will be made comfortable at either THE VENDOME or THE BRUNSWICK, both delightful hotels situated in Back Bay, or the residential section of Boston. Several days may be spent here, with profit, visiting the famous historical places, such as Bunker Hill, "Old South Church," Harvard University at Cambridge, Old State House, Kings Chapel, Old Christ Church, and many others.

Leaving Boston on the tenth day, various interesting towns and villages are met with. At Sudbury, time should be taken to inspect the "Wayside Inn," the Mecca for the lover of the quaint. One passes through Worcester, Springfield, and Hartford, reaching Waterbury via Plymouth. THE ELTON, practically the end of the tour, will be found attractive after a long day's run over the splendid macadam roads of Massachusetts and Connecticut.

The eleventh day finds one bound for New York, along the Housatonic River, through Danbury, across the New York State line, striking a portion of the Briarcliff Course and down past historical White Plains to New York City, having completed a thousand miles of the most beautiful and interesting sections of this broad country. Fine Golf Links are found at nearly all points and the Tourist who has the time to stop en route, should include his clubs in his touring equipment. Numerous opportunities are found for the disciples of Walton to enjoy good fishing along the route and one may go prepared for trout or bass according to his fancy.

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The third day, the tourist passes on through Pittsfield, Lanesboro, and New Ashford, where Mount Greylock towers grandly, a fore-runner of White Mountain scenery. Just beyond Greylock, is Williamstown and venerable Williams College. At Bennington is the site of the Battle of Bennington, which is suitably marked by a monument. At Manchester, the EQUINOX HOUSE, one of the oldest resort hotels in the country, but modernized and up-to-date in every way, situated at the foot of Mount Equinox, is the resting place. Here is the Ekwanok Country Club, whose golf links is acknowledged by good golfers to be one of the finest courses in the country.

On the fourth day, after crossing the Connecticut River at Springfield, Vt., New Hampshire is reached. A point of interest, on this day's trip, is the country estate of the late John Hay, Secretary of State, at Newbury. SOO-NIPI-PARK-LODGE is a new and most delightful resort house, and the Tourist who will spend the night here will be delighted with the beautiful scenery and the good accommodations. Interest is added to this point by nearness of the famous Corbin Game Preserve.

The fifth day takes one into the White Mountains through the Pemigewassett Valley, which begins at Plymouth, where the Tourist will stop for Luncheon at the PEMIGEWASSETT HOUSE, long famous as the starting point of the coaching trips into the White Mountains. Passing up the valley, the Flume House is reached, and it would well repay the Tourist to tarry here and journey on foot to visit the Flume, about one mile distant, which is one of the most interesting features of the White Mountains. Going on up through to the Franconia Notch, justly famous for its towering cliffs and magnificent scenery, the PROFILE HOUSE is reached. The old Profile House was well known to all travellers who visited the White Mountains in the past. The NEW PROFILE HOUSE was erected in 1906, on the site of the old building, and this beautiful house with its cottage colony accommodates nearly five hundred guests. Within a short distance from the hotel, is the "Old Man of the Mountains," one of the natural wonders of the world. In the opposite direction from the Hotel, is Echo Lake, one of the prettiest bits of scenery in the Mountains and noted for its echo. Also Profile Lake, known as the Old Man of the Mountains Mirror.

The sixth day is a short run to Bretton Woods, where, in the heart of the White Mountains, are located the magnificent MOUNT WASHINGTON and the home-like and comfortable MOUNT PLEASANT HOUSE. The MOUNT WASHINGTON is one of the most costly and beautiful resort hotels in the country, and has increased the fame and patronage of the White Mountains since its erection a few years ago. The Presidential Range is seen from this point in all its grandeur. The "Tip Top" House on Mount Washington and other points of interest are easily accessible from here. These places are famous from a motoring standpoint, as the finishing point of the Glidden Tour, and the starting point of the "Climb to the Clouds" of recent years.

The seventh day, or rather the seventh stage of the journey, if the Motorist has been exploring the beauties of the various stopping places, takes one down Crawford Notch between Mt. Webster and Mt. Willey; the latter is the scene of the slide which buried the Willey family many years ago. Leaving the Mountains and following the Soco River past Glen Station to Nort Conway, which is the southern gateway t the Mountains, and passing into Maine a Fryeburg, through Bridgton to Naples, som fine scenery along numerous lakes an ponds is enjoyable, as well as the rollin farm and wooded slopes of this part o Maine. At Poland Spring, famous th world over for its remarkable natura Spring Water, is situated the justly famou POLAND SPRING HOUSE, one of the mos delightful resort houses in the country and the MANSION HOUSE, which has bee in the possession of the Ricker family fo over 100 years. The Maine State Building used as a Library and Art Building, wa the "Maine Building" at Chicago World' Fair, and was removed by the owners o Poland Spring to its present location, ston by stone. A visit to Poland is not compl without an inspection of the Spring a Bottling Houses, the latter being the fin building in the world used for such p poses.

The eighth stage is through Portlan where the coast is reached. A most beau ful city,—the birth-place of Longfellow,— where numerous points of interest abour Following the rugged coast through Kenn bunk, York Beach and Wells, well know for their beautiful summer residences, t Kittery, the last town in Maine, one crosse the Piscatague River to Portsmouth famous for its Navy Yard and as a scene the Russian-Japanese Peace Conference 1905. Portsmouth has many beautiful ol houses of the period of the Revolution At New Castle, a famous historic town nea Portsmouth, is situated the HOTEL WENT WORTH, which will be found a modern a delightfully situated house, accommodati five hundred guests. This House was mu in the public eye, in 1905, as the headquar ters of the Japanese and Russian Peac Commissioners.

The ninth lap, through Newburyport Mass., Ipswich and other historical towns including Salem, the "Witch Town" of earl days, to Boston, where the Tourist will b made comfortable at either THE VEN DOME or THE BRUNSWICK, both delight ful hotels situated in Back Bay, or the resi dential section of Boston. Several day may be spent here, with profit, visiting th famous historical places, such as Bunke Hill, "Old South Church," Harvard Univer sity at Cambridge, Old State House, King Chapel, Old Christ Church, and man others.

Leaving Boston on the tenth day, variou interesting towns and villages are met with At Sudbury, time should be taken to inspec the "Wayside Inn," the Mecca for the love of the quaint. One passes through Worces ter, Springfield, and Hartford, reachin Waterbury via Plymouth. THE ELTON practically the end of the tour, will b found attractive after a long day's run ove the splendid macadam roads of Massachu setts and Connecticut.

The eleventh day finds one bound fo New York, along the Housatonic River through Danbury, across the New Yor State line, striking a portion of the Briar cliff Course and down past historical White Plains to New York City, having complete a thousand miles of the most beautiful an interesting sections of this broad country Fine Golf Links are found at nearly a points and the Tourist who has the time t stop en route, should include his clubs i his touring equipment. Numerous opportu nities are found for the disciples of Walto to enjoy good fishing along the route and on may go prepared for trout or bass accordin to his fancy.

otels mentioned, or New England Resorts Information Bureau, 1180 Broadwa
y York, for illustrated booklet and detailed route description.

AERONAUTICS

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Furnished on application. The value of AERONAUTICS as an advertising medium is unquestioned.

THIS number, the twelfth, completes our first year and we take this opportunity of thanking our subscribers and advertisers for the hearty support they have given our attempt to advance aeronautics.

We found discouraging pessimists on every hand when we started a year ago, in July. They told us we were ahead of the times, that there was no demand for such a Journal and that we were doomed to failure. We have proven them in error—and for this we are glad.

The art is young indeed but a very healthy infant. The coming year holds great promise. How fast the art will progress it is wild to forecast. Centuries of experiments have been turned during almost a single year into practical flight. It only remains to develop further the machines that are making daily flights. It was a long time before we had an automobile, but when the first one arrived the ultimate perfection of the motor car took but ten years. It is possible that with the flying machine the progress will be still more rapid, for we have all the engineering knowledge of the past ten years. The explosive motor had to be invented and perfected before we could have the automobile. We have the motor now in a state of perfection and we are the gainer by that much.

The principal hindrance to advancement in the art has been lack of funds with which to carry on experiments, and the treatment the idea of flying has received at the hands of an incredulous or facetious press has created in the public mind such distrust of the possibility of flight that it has been well nigh impossible for an inventor to secure funds.

Attempts recently made to secure funds have been miserable failures. It is only within a couple of months that the press has seen the reality of the subject but it will take some time yet to counteract the depressing publicity of past years. What we need right now is money for the advancement of the art, offered privately to deserving inventors or as prizes. There are many who can and will raise money to build machines if they can be shown a prize to be won on the conclusion of their work.

OUR RECENT EXPERIMENTS IN NORTH CAROLINA.

Wright Brothers,

For those readers whose acquaintance with aeronautics is limited to the last few years, this account of our recent experiments in North Carolina is prefaced with a short account of our previous work.

Up to the year 1900, our interest in the subject had been confined mostly to reading and theorizing. But in the Fall of that year we began out-door experiments on the coast of North Carolina, near Kitty Hawk. Here we attempted, at first, to fly our machine as a kite; but later made some short glides on the slopes of the Kill Devil Hill.

The gliding experiments were continued in the years 1901 and 1902. A number of flights were made of over a minute's duration. The rate of descent was reduced to an angle of 7 degrees.

The account of these experiments given by Mr. Chanute in talks before scientific societies in Europe, and in articles contributed to technical papers, created some interest. A number of persons took up experiments in France with machines built on the drawings and descriptions furnished in Mr. Chanute's articles. Among these

SCHEDULE OF FLIGHTS DURING MAY, 1908.

Date	No. Passengers	Distance	Time	Velocity of Wind
May 6	One	1008 feet	0:22 s.	8 to 12 miles an hour
May 8	One	956 feet	0:31 s.	20 miles an hour
	One	2186 feet	0:59½	16 miles an hour
May 11	One	0.78 miles	1:11	8 miles an hour
	One	1.80 miles	2:28	No record
	One	1.55 miles	2:11	No record
May 13	One	0.60 miles	0:51 s.	No record
	One	1.85 miles	2:44	16 to 18 miles
	One	....	2:40	14 to 16 miles
	One	2.40 miles	3:20	14 to 16 miles
May 14	Two	0.45 miles	0:29	No record
	Two	2.50 miles	3:40	18 to 19 miles
	One	5. miles	7:20	No record (about 15 miles)

were the well-known aviators MM. Archdeacon, Esnault-Pelterie and the Voisin Brothers, builders of the Farman and Del grange aeroplanes. Captain Ferber had already been experimenting for some months with what he termed a "Chanute-Wright" machine.

In 1903 we added a motor to our machine, and on the 17th of December made four flights with it. The longest of these covered a distance of 852 feet in 59 seconds against a 20 mile wind.

In 1904 we continued the experiments on a new ground near Dayton, Ohio. The longest flights of that year were two of five minutes each, covering distances of 3 miles.

Experiments were resumed in the summer of 1905 at our grounds near Dayton. Five flights were made in September and October of that year, covering distances of from 11 to 24 miles. The account of these flights, published in l'Aerophile, of Paris, in December, 1905, created a sensation in France, and many more persons took

up experiments with enthusiasm. Among these were Santos-Dumont, Delagrange, and later, Farman. The news of these flights was received by the daily press as a "clap of thunder out of a clear sky," and some discussion arose as to the truthfulness of the report. A number of persons from France, England and Germany, as well as from different parts of our own country, made trips to Dayton to make personal investigation of the matter. Though many came incredulous, not one returned in doubt.

Our recent experiments were conducted upon the grounds, near Kitty Hawk, North Carolina, where we experimented in 1900, 1901, 1902 and 1903. The flyer used in these experiments was the one with which we made the flights in September and October, 1905, near Dayton, Ohio. The means of control remained the same as in those flights, but the position of the controlling levers and their directions of motion had to be altered in order to permit the operator to take a sitting position. A seat

ORVILLE WRIGHT.

WILBUR WRIGHT.

for a passenger was added. The engine used in 1905 was replaced by a later model, one of which was exhibited at the Aero Club Show at New York in 1906. Larger gasoline reservoirs and radiators were also installed.

We undertook these experiments in order to test the carrying capacity of the machine, and to ascertain its speed with two men on board, as well as to regain familiarity in the handling of the machine after a period of almost three years without practice. No attempt was made to beat our record of distance, made in 1905.

The first flights were made over a straight course against winds of 8 to 18 miles an hour. The equilibrium of the machine proving satisfactory in these flights, we began to describe circles, returning and landing at the starting point. These flights covered distances of from 1 to 2½ miles.

On the 14th of May a passenger was taken on board. In the first flight the motor was shut off at the end of 29 seconds to prevent running into a sand hill, towards which the machine was started. But in a second, the machine carried the passenger and operator for a flight of three minutes and forty seconds, making a complete

circle, and landing near the starting point. The wind, measured at a height of six feet from the ground while the machine was in flight, had a velocity of 18 to 19 miles an hour. The distance traveled through the air, as registered by an anemometer attached to the machine was a little over four kilometers (2.50 miles), which indicated a speed of about 41 miles an hour. A speed as high as 44 miles an hour was reached in an earlier flight, with only one man on board.

In a later flight, on May 14th, a false movement of a controlling lever caused the machine to plunge into the ground when traveling with the wind at a speed of about 55 miles an hour. The repairs of the machine would have necessitated a delay of five or six days, and as that would have consumed more time than we had allowed for the experiments, we discontinued them for the present.

WATCHING THE WRIGHT BROTHERS FLY.

By Byron R. Newton.

(Editor's Note.—As correspondent of the New York Herald Mr. Newton witnessed the important flights made recently by the Wright Brothers in North Carolina and besides giving to the world exceptionally interesting and accurate accounts of their achievements, took the first photograph ever published of their motor aeroplane in flight.)

The month of May, 1908, will doubtless be known to future generations as the most important period in the development of aerial navigation. There may have been other months when more was accomplished in a rudimentary way, but during the middle week of May civilization learned that mechanical flight was at last a reality and not a mere human aspiration. The world received its first news that this dream of the ages had been realized—that Wilbur and Orville Wright of Dayton, Ohio, had surely mastered the mighty problem, and, with the sea gulls and the buzzards, were soaring about over a desolate strip of beach on the coast of North Carolina.

And, singularly, too, of the world's millions eagerly interested in the matter, there were exactly five persons there as witnesses of these magical performances—five newspaper correspondents, each of whom had regarded the Wright Brothers as little more than theorists, dreamers or fakirs, until they saw the big aeroplane mount into the air, and, clacking like a great sea bird, come circling over their heads. I went down to North Carolina a pronounced skeptic. I had no doubt that the Wrights had been very successful in experimenting with gliding machines, I did not question that they had gone a step farther with their motor driven machine, but I did not believe they had made conspicuous progress in sustained flight and I did not believe they had made a record of twenty-four miles as claimed by them.

I believe all these things now and much more. About a year ago Frank S. Lahm, the veteran aeronaut, told me he was certain the Wrights could make sixty miles an hour with favoring conditions and that the duration of their flight was measured only by the amount of fuel they carried for the motor. I was sorry to hear the old gentleman utter this statement because I felt sure he did not believe what he said. I am convinced now that he knew perfectly well what he was talking about. On the afternoon of May 14, there is not the slightest doubt in my mind that their machine was making nearly, if not quite, that speed when it disappeared from our view and was hurled to the ground behind one of the big sand hills.

There is a vast difference between the aeroplane on paper and the aeroplane in the air. We study the drawings and photographs of these wonderful machines and imagination fashions an outline of the thing in action, but imagination cannot anticipate the sensations that come when, for the first time, one beholds this huge mechanical creature leap into the air and glide away with the grace of a swallow and the speed of a racing automobile. Thinking men and women of our generation have in store a great treat when they shall have the good fortune first to witness this marvel of creation.

I suppose most of us have dreamed of flying or of seeing others soaring comfortably about above familiar places and have awakened with feelings of regret that it was only a dream. When one first looks up at an aeroplane sailing in mid air, it is like waking from such a dream to find that the vision is a thrilling reality. It brings a singular exhilaration. It is different from the contemplation of any other marvel human eyes may behold in a lifetime. It awakens new emotions. It brings to one the imper-

fectly defined consciousness that another world has been opened to us. The thought comes: "Is not this great ocean of air above us to become as useful for our pleasure and our activities as the sea or the land?" We get our first real conception of the new element in which we are to perform human functions. It is not until then that we appreciate the limitless possibilities of air navigation, for, no matter how skeptical we may have been about the practical phase of flying machines, those doubts are largely dispelled when we behold a perfectly balanced craft carrying two men and its own weight of half a ton through the air just as easily as a motor boat skims the water of a placid lake. Looking at this thing, one forgets theory, forgets doubt, forgets past ages of painful effort and ridicule and turns with intense thought to the wonders of the near future.

Weather worn and decaying, the old gliding machine used ten years ago by the Wrights, is gradually disappearing under the drifting sands at Kitty Hawk Hill. It lies near their abandoned aerodrome, built for the first experiments there, so far removed from human paths that vandals and relic hunters have never disturbed it.

Some day, when the world has had time to understand the great achievements of these modest men, scientists and historians will dig up the fragments of this old gliding machine and civilization will erect a great monument there. And why not? Glance backward over the list of human achievements and see if you can find a man or group of men who have made so great a discovery as have these humble bicycle makers of Dayton. What other achievement compares with theirs! Men learned to navigate the water by slow degrees. It was a process of gradual evolution. Rapid transportation over the earth came naturally with the discovery of steam power. The telegraph and telephone and the many benefits that have accrued to civilization through the utilization of electricity were the result of years of investigation by thousands of scientists; but the discovery of mechanical flight was in reality the work of two men, wrought, miracle-like, within a brief decade, here among the sand dunes of the Atlantic coast.

This is not an unfair claim for the Wrights, because, no matter what may now be accomplished by other inventors, it is undisputed that rudimentally and progressively they worked out the great secret, perfected the gliding machine, made the first successful use of the motor, as applied to aviation, and performed hundreds of sustained flights of a mile or more long before any other aeroplane in the world had made a considerable start in the work already completed by the Ohio men.

This article, however, is not designed to deal with the technical or historical aspects of the Wrights' performances. It is intended only to relate briefly what they did between May 10 and May 15 on the Carolina beach. Scientists will soon begin to analyze their work and historians will presently delve deeply into their lives and the story of their antecedents. If there is anything in heredity doubtless we shall discover, somewhere among the Wrights' progenitors, men of great mechanical and inventive genius, because much of the success attained by Wilbur and Orville Wright may be credited to their extraordinary knowledge and skill as mechanics.

It is often asked why the Wrights selected a corner of the earth so remote from human activities and comforts, for their testing grounds. Look at a map of North Carolina and you will understand, in part. The map will indicate the inaccessibility of the place, and that was the principal thing they were after. But the map will not show the weird isolation, the primitive wildness and the oppressive solitude and loneliness of a spot so far removed from the zone of civilization. The map will show the narrow strip of beach extending for hundreds of miles between the ocean and Albemarle, Pamlico and Roanoke sounds, but it does not show the noisome swamps and jungle, the thousands of moccasins, rattlers and blacksnakes, the blinding swarms of mosquitoes, the myriads of ground ticks and jiggers, the flocks of wild turkeys and other fowl, the herds of wild hogs and cattle and the gleaming white sand mountains which have played so important a part in the Wright's famous achievements. The nearest human habitation is the little hamlet of Manteo, on Roanoke Island, ten or twelve miles distant, with Roanoke Sound lying between that spot and the sand hills.

It is a singular coincidence that on Roanoke Island another great event in the world's history took place. There, in 1585, was made the beginning of Anglo-Saxon civilization in the Western Hemisphere by the settlement of a colony of Englishmen sent across the ocean by Sir Walter Raleigh. The colony was lost and the world has never known what became of it. The forest grew up over the old fort and the greater part of the island is as silent and wild today as on the July morning that Raleigh's ships sailed into the sound. The present dwellers on the island are as ignorant of the modern world as if they lived in the depths of Africa. The sound of a steam locomotive is as unknown to them as the music of Mars. An automobile is as much a myth as Noah's ark and the flying machine across the sound they regarded as a sea serpent yarn invented by Yankee reporters, the first strangers since the Civil War to invade their island domain. With this enviroment it may be understood how these secretive Ohio men were able for more than ten years to keep their secret from the world.

When the little band of correspondents arrived in Manteo they decided to feel out the ground by sending one of their number to ascertain if there was any change in the Wrights' policy of secrecy. It was a day's journey and a fruitless one. When the scout reached the aerodrome, nestled between Kitty Hawk and Kill Devil Hills, the Wrights were about to make a flight, but at the approach of a stranger they wheeled the aeroplane back into the building, closed the doors and advanced to meet their visitor. They were civil but very firm. "We appreciate your good intentions," they said, "but you can only do us harm. We do not want publicity of any sort. We want to go on with our experiments, but so long as there is a stranger in sight we shall not make a move. Come back a month from now and we will show you something worth telling to the world. At present, we are simply experimenting with new features of our machine."

Then one of the brothers and their assistant mechanic walked with the correspondent back to his boat and watched it far out on the sound toward Manteo.

The next morning at 4 o'clock, equipped with a guide, water and provisions we set out determined to ambush the wily inventors and observe their performance from a hiding place in the jungle. After a tedious journey over sand hills, through long vistas of pine forest and through miles of swamp and marsh land in which two of the men narrowly escaped the poisonous fangs of moccasins, we found a spot opposite the aerodrome commanding a clear view of the beach and sand hills for a distance of five miles in either direction. There for four days we lay in hiding, devoured by ticks and mosquitoes, startled occasionally by the beady eyes of a snake and at times drenched by heavy rains. But it paid. We saw what few human eyes ever before had witnessed and had the satisfaction of telling the world about it.

Often we wondered if these men ever slept. They were at work before the sun came up, they frequently made flights in the early twilight and lamps were flickering about the aerodrome until late into the night.

The first flight we all witnessed was made early in the morning. As we crept into our hiding place we could see the doors of the aerodrome were open and the machine standing on its mono rail track outside. Three men were working about it and making frequent hurried trips to the aerodrome. Presently a man climbed into the seat while the others continued to tinker about the mechanism. Then we saw the two propellers begin to revolve and flash in the sunlight. Their sound came to us across the sand plain something like the noise of a dirigible balloon's propellers, but the clacking was more staccato and louder. The noise has been described as like that of a reaping machine and the comparison is a very good one. We were told by a mechanic who assisted the Wrights that the motor made 1,700 revolutions a minute but was geared down so that the propellers made but 700 revolutions.

For several seconds the propeller blades continued to flash in the sun, and then the machine rose obliquely into the air. At first it came directly toward us, so that we could not tell how fast it was going except that it appeared to increase rapidly in size as it approached. In the excitement of this first flight men trained to observe details under all sorts of distractions, forgot their cameras, forgot their watches, forgot everything but this aerial monster chattering over our heads. As it neared us we could plainly see the operator in his seat working at the upright levers close by his side. When it was almost squarely over us there was a movement of the forward and rear guiding planes, a slight curving of the larger planes at one end and the machine wheeled about at an angle every bit as gracefully as an eagle flying close to the ground could have done.

It appeared to be twenty-five or thirty feet from the ground and so far as we could judge by watching its shadow sweeping along the sand, was going about forty miles an hour. Certainly it was making the average speed of a railroad train.

After the first turn it drove straight toward one of the sand hills as if it were the intention of the operator to land there, but instead of coming down, there was another slight movement of the planes and the machine soared upward, skimmed over the crest of the mountain, 250 feet high, and disappeared on the opposite side. For perhaps ten seconds, we heard indistinctly the clatter of the propellers, when the machine flashed into view again, sailed along over the surf, made another easy turn and dropped into the sand about one hundred yards from the point of departure. No sooner had it touched the sand than men started from the shed with two wide-tired trucks. These were placed under the machine, the motor started and the aeroplane at once became a wind wagon rolling itself back to the starting track with the power of its own propellers. After each flight all the mechanism was examined in most painstaking manner, and the operator always came down when the slightest thing about the machinery was found to be working imperfectly.

When the machine was near us, in the air, we could see enough of its mechanism to indicate the recently published mechanical drawings purporting to give all details of the perfected machine, fall far short of disclosing all of its important features. There are several vital features of control by the new system of levers that the published

drawings do not show. These improvements were added very recently and used for the first time last month.

As a matter of truth, these recently published mechanical drawings have been an old story in the technical magazines for some time. Everything which is alleged to have been disclosed has been known to those interested in aerial science for several weeks. On May 1st the "Aerophile," the official organ of the Aero Club of France, printed all of the drawings recently produced in a New York newspaper, together with the specifications and descriptive matter presented by the newspaper as startling news. Even the "La France Automobile," subsequent to the publication by the "Aerophile," printed the same technical information.

During the first few flights we could not make out the meaning or function of a series of flat pipes resembling somewhat the segments of a steam radiator, set vertically and very close together near the motor. Later we learned these were the water cooling apparatus for the motor. It was discovered also by the remark of one of the Wrights, that they depend very largely upon the gyroscopic principle for their equilibrium. A visitor was expressing surprise that the machine could carry two persons, when Wilbur Wright remarked that once in the air he had no doubt that a weight of two hundred pounds could be placed on the outer end of the main planes without affecting the equilibrium of the craft.

After the first flight, we saw many others more remarkable. In the very next flight we were astonished to discover that two men were in the machine. At first we thought we were deceived by some optical or shadow effect, but when the aeroplane came down after making a flight of more than two miles, we plainly saw two men get out and examine the mechanism.

One thing that surprised us was its performance in the wind. With nearly every flight a fresh breeze was sweeping along the coast, usually about twenty miles an hour It appeared to be the purpose of the operators to start against the wind, but from our point we could not discover that the air currents had any appreciable effect upon the craft, either in its speed or steadiness. If anything, it moved steadier when driving against the wind. On several occasions we saw the machine sail straight away up the beach, until it was a mere speck, scarcely distinguishable from birds and other indistinct objects near the line of the horizon. During these flights the sound of the propellers would be lost altogether until the machine turned about and came back, frequently landing within a few feet of the starting point. These long flights must have covered a distance of four to six miles.

On the afternoon of May 14 when the machine was wrecked after making two circular flights of about eight miles, we learned that the Wrights had started with the purpose of making an endurance run of more than an hour, in which they expected to cover from fifty to eighty miles.

From the layman's viewpoint this last trip was the most interesting. They had just finished a very pretty short circuit of about two miles, with two men in the machine, and we expected the next one would be of similar character. The aeroplane started off in a very wide detour around three hills instead of two, and seemed to be flying a little higher than usual. It started near the aerodrome and in completing the first circuit, came back squarely over the same spot. We expected it to come down there, but when we saw the men on the ground swing their hats and heard them shout to the aviator, we realized that a performance of unusual moment was in progress. As the machine started on its second lap, it appeared to be increasing in velocity, gradually, and at the moment it disappeared behind the sand hill its shadow was racing across the sand plain with the rapidity of the fastest express train. The motor was making more of a buzzing sound and the machine appeared to be travelling much faster than we had ever noticed before. We did not learn of the accident until several hours later.

But there was a weird, almost uncanny side to the whole thing. Those present at the international balloon races at St. Louis last October will recall the feeling that swept over the thousands of men and women when they saw dirigible balloons go spinning away over the housetops like horses in a trotting race.

There was something an hundred fold more romantic, or ultra human, just as you please to express it, about these wonderful flights there on the lonely beach, with no spectators and no applause, save that of the booming surf and the startled cries of the sea birds. Often as the machine buzzed along above the sand plains, herds of wild hogs and cattle were frightened from their grazing grounds and scurried away for the jungle, where they would remain for hours looking timidly out from their hiding places. Flocks of gulls and crows, screaming and chattering, darted and circled about the machine as if resentful of this unwelcome trespasser in their own and exclusive realm There was something about the scene that appealed to one's poetic instincts,—the desolation, the solitude, the dreary expanse of sand and ocean and in the centre of this melancholy picture two solitary men performing one of the world's greatest wonders.

We were talking along these lines one afternoon when one of the correspondents reflectively asked: "I wonder if the Wrights ever feel this thing as we do?"

"No," answered another, "you may be very sure they do not. If they were addicted to poetry, rum and other common vices, the world might never have had a flying machine."

THE WORK OF THE AERIAL EXPERIMENT ASSOCIATION.

As Recorded in Associated Press Dispatches; Written by Dr. Alexander Graham Bell

May 17. The Aerial Experiment Association, which has its Winter headquarters at Hammondsport, N. Y., is an association of experimenters who are working conjointly to promote the progress of aviation in America.

At present there are five members: Alexander Graham Bell, F. W. Baldwin, J. A D. McCurdy, Glenn H. Curtiss and Thomas Selfridge. Their object is the construction of a practical aerodrome, or flying machine, driven through the air by its own motive power and carrying a man.

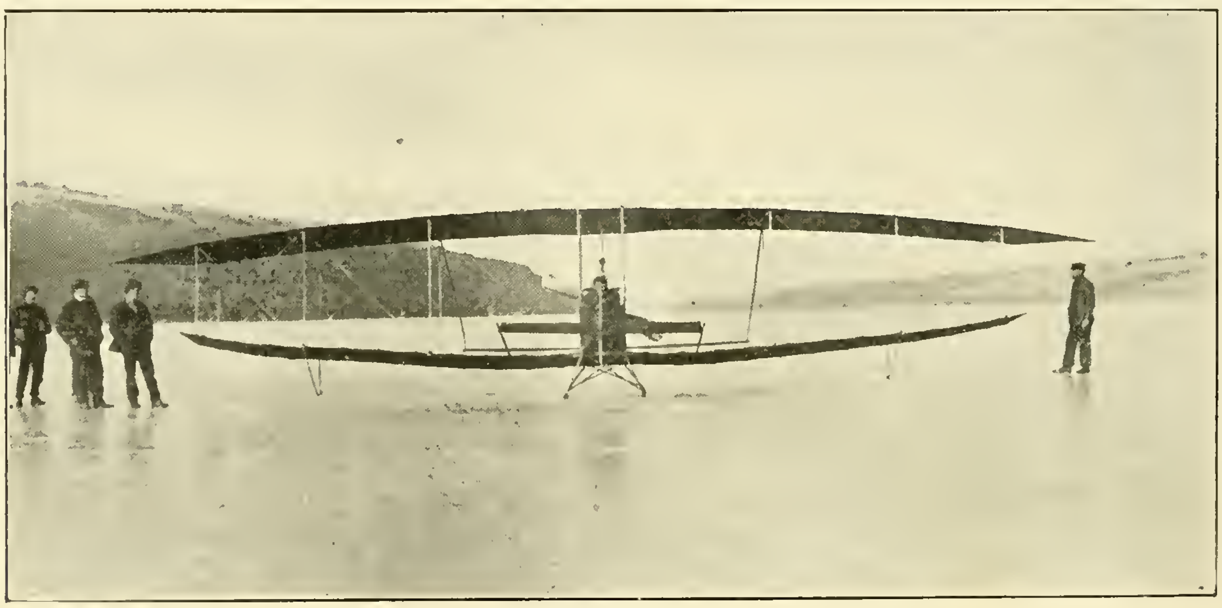
In pursuance of this aim, the Association has already built two aerodromes:

No. 1. Selfridge's "Red Wing," upon plans approved by Lieut. Selfridge; and

No. 2. Baldwin's "White Wing," upon plans approved by F. W. Baldwin.

The tetrahedral aerodrome of Dr. A. Graham Bell will probably be No. 3 and then will follow Nos. 4 and 5, the aerodromes of Mr. Curtiss and Mr. McCurdy. (Editorial Note—It has now been decided to build the aerodrome of Mr. Curtiss next, making it No. 3). It is expected that all these aerodromes will be built within the present year.

The two aerodromes that have already been completed have been wrongfully ascribed in the public press to Dr. Bell, the Chairman of the Association. His aerodrome has not yet been completed and work will not be resumed upon it until June,



RED WING.

when the headquarters of the Association will be removed to Baddeck, Nova Scotia, where Dr. Bell has his Summer home.

The work on Dr. Bell's machine progressed last year at Baddeck to the point of constructing a large tetrahedral kite known as the Cygnet, which on December 6th, 1907, successfully carried Lieut. Selfridge up into the air to a height of 168 feet over the waters of the Bras d'Or Lake. (See "Aeronautics" for January.) At the conclusion of this experiment the Cygnet landed very gently upon the surface of the water and floated there, quite uninjured by its experience in the air. It was subsequently wrecked by being towed at full speed through rough water by a powerful steamboat. By that time the season had so far advanced in Baddeck that further experiments with Dr. Bell's structures had to be postponed until the opening of navigation in the present year.

In June the Baddeck experiments will be resumed by the Association by the construction of another tetrahedral structure upon the general model of the Cygnet, and the attempt will then be made to convert the kite into an aerodrome, by providing it with motive power.

The first aerodrome actually completed by the Association was Selfridge's "Red Wing." This aerodrome made a successful flight of 319 feet over the ice on Lake

Keuka, near Hammondsport, N. Y., on March 12th, 1908, in the presence of many witnesses. This experiment was somewhat remarkable, as being the first successful public flight of a flying machine in America, the earlier flights of the Wright Brothers at Dayton, Ohio, having been made in secret. The machine had been provided with sledge runners, and glided over the ice for about 100 to 150 feet before it rose into the air. It then flew very steadily at a general elevation of from 10 to 20 feet above the surface of the ice, carrying Mr. F. W. Baldwin as aviator.

The newspapers very generally reported the aviator as Captain Baldwin the balloonist, but this is a different man. Mr. F. W. Baldwin is a young engineer, a graduate of Toronto University, and a grandson of the celebrated Robert Baldwin, one of the

RED WING.

founders of the Dominion of Canada, and Premier of Upper Canada before the confederation. Mr. F. W. Baldwin is the same engineer who designed and constructed the tetrahedral tower of steel which stands on Dr. Bell's estate near Baddeck, Nova Scotia; and the new aerodrome now awaiting trial at Hammondsport has been designed by him. (Editorial Note—Trials of this have now been made; see later on.)

Aerodrome No. 1, Selfridge's "Red Wing," came to an untimely end on March 17th, 1908 (see "Aeronautics" for April), by an accident which completely demolished the machine, although fortunately the aviator and the engine escaped uninjured. The Association then immediately began the construction of aerodrome No. 2, Baldwin's "White Wing."

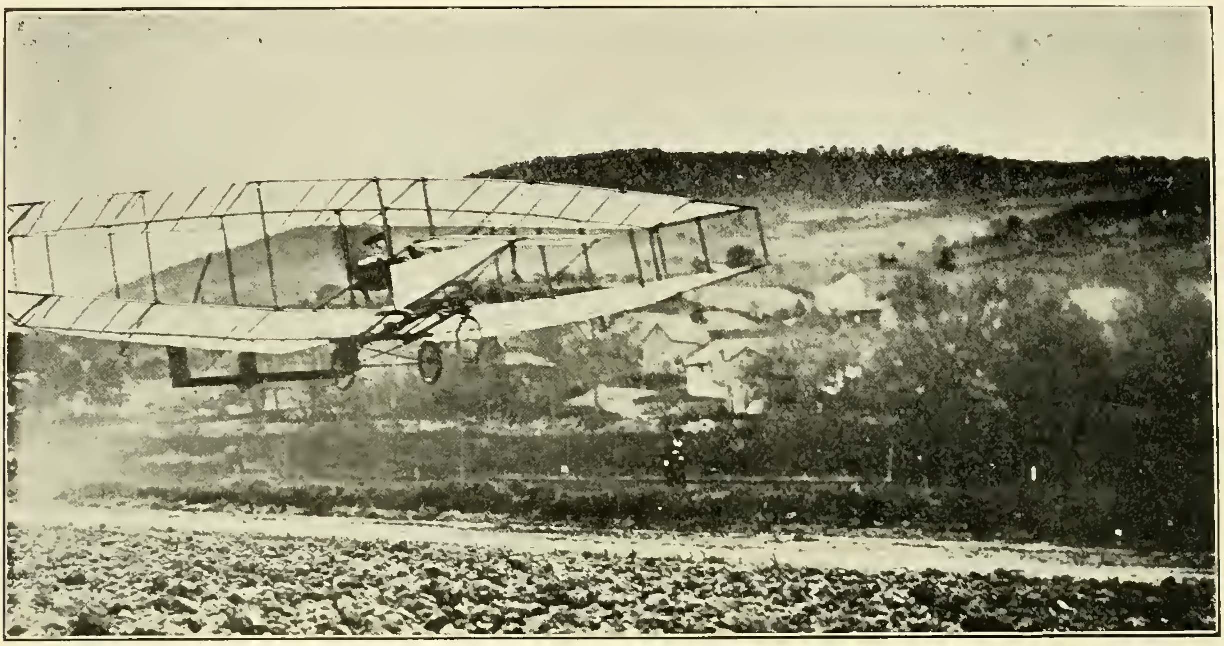
Both aerodromes have been constructed in the aerodrome shed of Mr. Glenn H. Curtiss, of Hammondsport, who acts as director of experiments for the Aerial Experiment Association. The actual work of construction has been under the charge of Mr. William F. Bedwin, superintendent of Dr. Bell's Baddeck laboratory. The engine employed was specially designed for the Association by Mr. Glenn H. Curtiss and was made by the Curtiss Manufacturing Company of Hammondsport.

May 13. An attempt was made today to fly the new areodrome, No. 2, Baldwin's "White Wing," at the race track near Hammondsport. The aerodrome had been provided with light wheels, like bicycle wheels, to enable it to run over the ground until sufficient headway had been gained to enable it to rise into the air. The race track, however, proved too narrow to enable it to be used for this purpose, as the ends of the wing-piece were not raised sufficiently from the ground to escape contact with the raised sides of the track. The attempt was therefore made to start the machine from the grass plot contained within the oval race track, but the attachment of the wheels proved to be too weak to stand the strain of running over rough ground and broke before much headway had been gained. The damage was repaired next day. The machine has been placed at a higher elevation above the wheels, so that it is hoped that the next experiment may start from the race track itself, instead of from the grass lawn, as the smoother surface of the track will give a better chance for getting up.

May 17. A preliminary trial was made this evening of the aerodrome, "White Wing," designed by F. W. Baldwin and constructed by the Aerial Experiment Association. The aviator's seat was occupied by Lieut. Thomas Selfridge, U. S. A. The

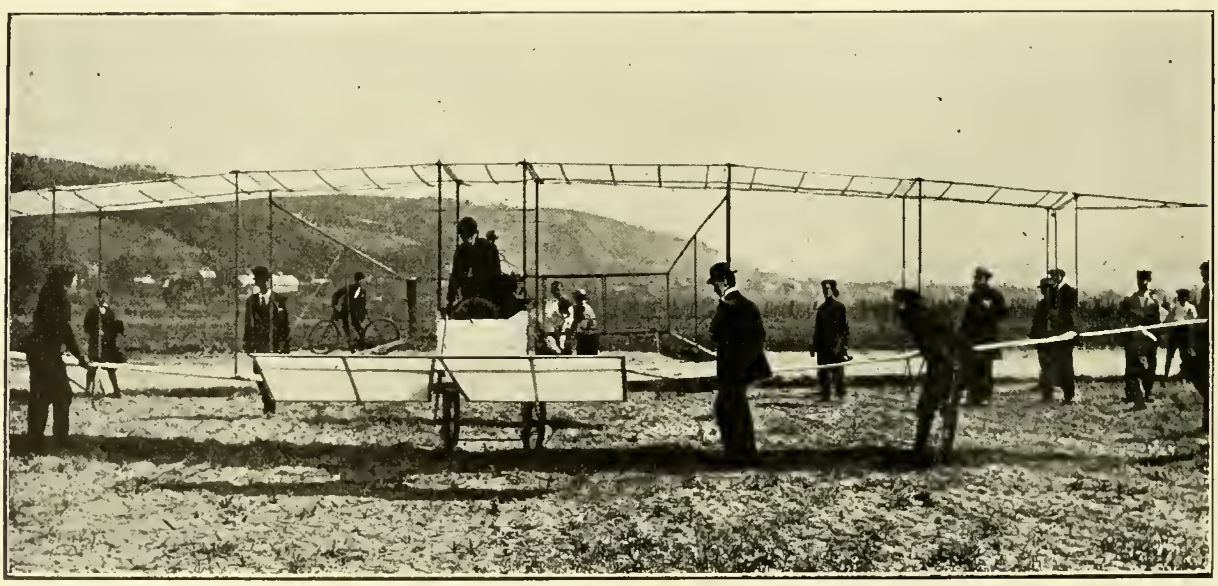
people of Hammondsport turned out in large numbers to witness the experiment. No attempt was made to rise into the air.

The machine had been provided with wheels, but steering gear was not attached to them, as it was thought that the aerial rudder would control the motion of the machine while on the ground. This proved insufficient for the purpose, however, for the machine could not be kept from running off the track to one side or the other. It was



WHITE WING.

therefore decided to make a slight change in the attachment of the front wheel, and provide it with steering gear, so as to enable the operator to steer the machine on the race track for a distance long enough to gain sufficient speed to get into the air. No attempt will be made to fly until the operators are satisfied that they have the machine under full control on the ground.



WHITE WING.

May 18. The aerodrome, "White Wing," made a short flight here today, carrying its designer, F. W. Baldwin, to a height of about 10 feet. The pressure of the air on the elastic edge of the lower aeroplane caused it to foul the propeller and the aerodrome was therefore brought down to the ground after having traversed a distance of 93 yards. The damage will be easily repaired.

The new steering gear, attached to the front wheel, worked satisfactorily, so that there is now no difficulty in keeping the machine on the race track while running on the ground. The race track has been widened by plowing up a portion of the adjoining field and smoothing it with a roller.

May 19. Lieut. Selfridge made two flights this afternoon in Baldwin's aerodrome, "White Wing." In the first experiment the machine ran 210 feet in 6½ seconds on the race track before leaving the ground, and made a flight of 100 feet in 2 seconds at an elevation of 3 feet, running 201 feet on rough ground after landing, without injury to the running gear. The flight was impeded by loose guy wires catching in the propeller, but no damage resulted. In the second experiment the machine made a beautiful and steady flight of 240 feet at an elevation of at least 20 feet in the air, but landed badly in a newly plowed field. The aerodrome is uninjured, but the truck carrying the front wheel plowed into the ground and the front wheel was injured. The damage can easily be repaired. The members of the Association are encouraged to believe that the engine has abundant power, and the machine is under good control in the air, so that skill alone on the part of the aviator is all that is needed to accomplish much longer flights.

WHITE WING.

May 22. Glenn H. Curtiss in the aeroplane, "White Wing," this afternoon made the longest first flight for a machine heavier than air that has ever been witnessed in this country. The "White Wing" flew 1,017 feet in 19 seconds, and with the exception of the dropping of a bolt, no damage was done to the aeroplane. Mr. Curtiss had perfect control of the machine throughout and the steering was accomplished with ease.

It was 6:20 when the test of the motor was made. It was impossible to get the machinery under way before that hour owing to a heavy wind from the southwest, but with the setting of the sun came a calm. The "White Wing" rose and soared at a height of 15 feet directly down the valley. Her first flight was 615 feet. Then she dipped and for a fraction of a second touched the tips of the grass, but answering the touch of the aviator's control the "White Wing" rose again and continued her flight for 402 feet. Then Mr. Curtiss, fearing that she would touch again, made the descent and for a hundred feet the wheels of the aeroplane ran smoothly over the plowed field. So perfect was the aviator's control of the movable tips that neither of the wings touched the ground. This is the longest flight ever made in a heavier than air machine by an aviator on his first trial.

The "White Wing" was driven by a Curtiss 8 cylinder air cooled motor weighing 145 pounds. This engine develops 40 horsepower at 1,800 revolutions per minute and is one of the lightest engines ever built. Only 25 horsepower, or 1,200 revolutions, are required to drive the machine into the air.

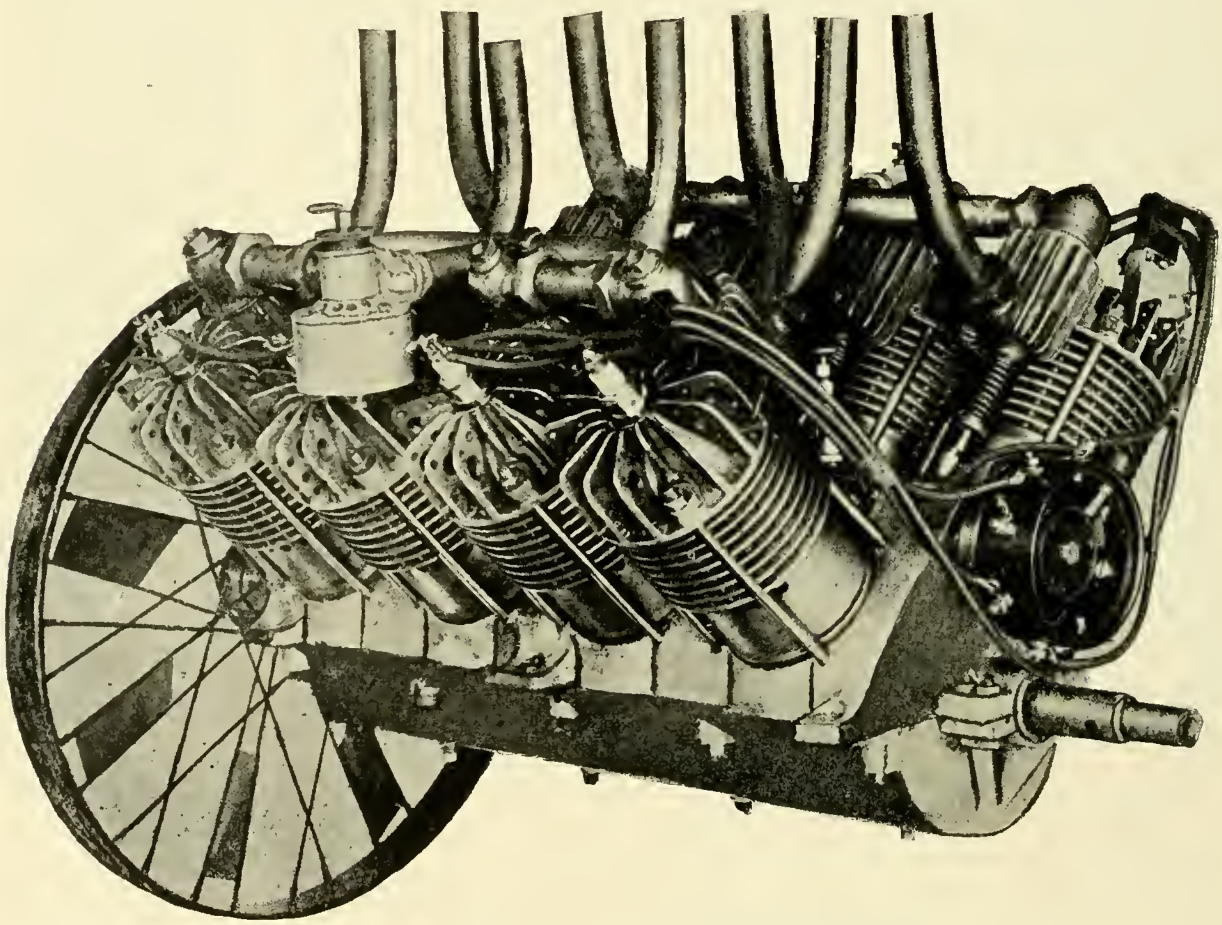
May 23. In the Saturday trials, it was decided that J. A. D. McCurdy should oc-

cupy the aviator's seat. The machine was brought out at 3 o'clock in the afternoon and pushed around the half-mile track to the end of the back stretch, from which the start was made. Six men were instructed to hold the "White Wing" while the engine was being started and until Mr. Curtiss gave the word to "let her go;" when she darted forward and speeded down the stretch for about 200 feet, by which time she had gained a speed of 30 miles an hour, then rose rapidly into the air. The flight continued for 600 feet at a height of 10 to 15 feet. A large vineyard directly ahead made a landing necessary. This landing proved rather disastrous to the machine. She struck the ground at too great speed and turned completely over. Luckily, however, Mr. McCurdy was not injured in the least.

This series of flights are the only public ones ever made in America.

Mr. J. Newton Williams, who is experimenting with a helicopter at Hammondsport, in describing the flight of Mr. Curtiss said "He operated all the controls—and made them control. I saw him successfully control the elevation and the lateral equilibrium and he steered straight at will, keeping the machine over the track till it reached sufficient elevation, then across the fields in a direction to avoid the vineyards."

Curtiss Motor Used in the Aerial Experiment Association Aerodromes.



This engine has eight air-cooled cylinders, two sets of four set at an angle of 90 degrees on an aluminum crank case with two connecting rods attached to each throw of the cranks.

The cylinders are cast of air furnace iron and after being carefully bored, the flanges are turned on the outside. The cylinders are then ground on the inside to a perfectly true and smooth surface.

The pistons are made in the same manner and the rings, after being ground on the sides in a magnetic ring grinder, are slotted and carefully re-turned.

The crank shaft is made of vanadium steel, bored out hollow, especially treated, toughened and ground to size on all of the bearings. The bearing metal is Parson's "white brass," which makes a very light and durable bearing. All of the studs and bolts are vanadium or nickel steel. The exhaust valves are made with nickel steel heads electrically welded to soft steel stems. The exhaust valves all have a 30 degree seat and are operated from a single cam shaft. The intake valves are automatic.

The engine complete, with balance wheel, commutator and distributor, weighs 145 pounds. Lubrication is effected by the splash system, the case being fed by two sight feed oilers, and the ignition is accomplished by six dry batteries and a single non-vibrating coil.

SYMPOSIUM.

We have written letters to various ones prominent in aerostation and aviation, editors of newspapers and scientists, business men and those generally interested, asking their views as to the present state of the art, its future, criticisms or words of encouragement—just as it appears to their individual minds. The following are some of the results. We regret that lack of space prevents printing all of these in this issue.

O. CHANUTE.

FUTURE USES OF AERIAL NAVIGATION.

At the very threshold of the present century, i. e., during the last seven years, extraordinary advances have been made in aerial navigation and we are now in possession of two solutions: one with dirigible balloons and one with flying machines. As we mark these great successes we also begin to perceive the limitations of the vessels, so that we may speculate upon their future uses.

Granting safety ultimately attained, the most important requisite for air craft is that of speed, to stem the winds that blow. Records show that winds attain speeds of twenty-five miles an hour or over near the ground, for about twenty per cent. of the year, and that they are much swifter aloft than near the ground.

Dirigible balloons have now been brought under fair control and have increased in speed from the seven miles an hour, attained by Giffard in 1852, to about twenty-five to thirty miles an hour with the French war dirigibles. It is claimed that thirty-five miles an hour has been obtained with the Zeppelin and this enormous balloon, over 400 feet long, must be very near the limit of possible speed and of practicability in landing. It may come to grief this year.

European nations are building aerial navies for war purposes. France now has two dirigible balloons and is building three more. Germany has three. England has a new one almost completed, while Russia, Austria, Spain, Italy and Belgium are entering upon the same course.

With flying machines a tremendous advance has been achieved. It is now generally admitted that the Wright Brothers told the absolute truth in stating that in 1905 they made successive flights of 11, 12, 15, 21 and 24 miles at speeds of about 38 miles an hour; while Farman and Delagrange in France have since made public flights varying from one to eight miles and promise to attain still better results this summer. Enthusiastic aviators all over the civilized world are preparing to test new designs and may have some surprises in store, while the coming tests of the two flying machines contracted for by the U. S. Signal Corps with A. M. Herring and with Wright Brothers, which are to come off next August, promise to mark a new era in the development of this inchoate craft.

Therefore, the question occurs as to what is to be the probable use to man of these new modes of transit. We can already answer that they will have no commercial value for the regular transportation of freight or passengers, as the useful loads will be too small and the trips too uncertain and irregular. We may, however, discuss their merits for sport and for war purposes and leave it to the future to show whether new utilities are to be found beyond those of explorations of otherwise inaccesible regions.

And first we may conclude that the dirigible balloon is too costly to serve in sport save in public shows. To obtain twenty-five to thirty miles an hour the balloon must approximate in size the French Lebaudy or Patrie, and these cost $50,000 or more.

Smaller sizes affording lesser speeds would have to await still days to be played with.

For war purposes the dirigible balloon has decided uses as a reconnoitering implement, and is likely to remain the one preferred for some years, because it affords a number of advantages: in that the flotation is independent of the motor, that the vessel can carry crews of 6 to 8 men, and that it can ascend quickly beyond cannon fire by throwing out ballast. As against these merits it has the following disadvantages: Its speed is less than that of many winds which prevail during a campaign, its frailty exposes it to wrecks in landing and its unstable vertical equipoise will make it quite unsuitable to operations close to the ground. Hence it will render little service by dragging flaming torches among houses or by shooting or dropping explosives because of the uncertainty of aim while going at speed. Neither the balloon nor the flying machine, therefore, seem to promise to be very effective weapons.

Apparently the chief use for flying machines will be in sport. Their advantages will be that of cheapness, as the cost need not exceed $5,000; also the superiority of their speed, which is now forty miles an hour and presently will be increased to fifty miles an hour or more. Moreover, they are small and cheaply housed. Their disadvantages are that their useful loads will probably always be small, as their own weight increases faster than their total carrying capacity; just the reverse of what obtains with

balloons in which the lifting capacity, and therefore the useful load, increases faster than the necessary weight of the apparatus. Besides that there is a certain element of danger to limit use in sport, and this will greatly restrict the use of flying machines.

For war purposes flying machines will serve almost wholly for scouting or reconnoisance and will be very efficient. For this a crew of three men seems to be required in action: one to run the motor and to steer; one to make continuous observations and one to signal the results, either by wireless telegraph or by flags. As a weapon of offense flying machines will probably be worthless because of their small carrying capacity.

It is said that recent military experiments indicate that dirigible balloons must be up 3,000 feet and flying machines 1,500 feet in order to be moderately safe but not immune from artillery fire. In a single combat between the two, if at the same level when they first see each other, the balloon would probably escape by throwing out ballast. Thus if they were a mile apart the balloon can rise 1,200 feet in the minute and a half required by the flying machine to go that distance, during which it could not rise 1,200 feet. The craft highest up will always have an advantage over the other, as shown by birds in the air. A possible plan would be to have a number of flying machines patrolling the sky at various altitudes as do the vultures in their search for food.

For exploration, both kinds of aerial craft will be very useful, but their flights will be limited by their fuel-carrying capacity where fresh supplies cannot be obtained. It is estimated that the Zeppelin No. 4 will have a radius of action of 1,500 miles. The specifications of the U. S. Signal Corps require that the flying machine shall carry enough fuel for a flight of 125 miles, but it is possible that this capacity will be doubled in future machines, although the radius of action will probably remain inferior to that of the dirigible balloon. It is possible, however, that the trips of the flying machine shall be enormously extended where winds can be utilized to soar and sail like certain species of birds.

Upon the whole, the usefulness of aerial craft will be inferior to that heretofore presaged by imaginative persons. They will not remodel civilization, they will not abolish frontiers and tariffs, nor modify architecture. They will serve in sport and in war, make many parts of the globe more accessible and abridge distance on special journeys. They may bring such new elements into war as to render it far less frequent, and they may develop such new uses of their own as to make the world better and happier.

PROFESSOR WILLIAM H. PICKERING, HARVARD COLLEGE OBSERVATORY.

THE FUTURE OF ARTIFICIAL FLIGHT.

The story has been often told of a famous scientist who died some years ago, that he had declared it impossible for a steamship to carry enough coal to take it across the Atlantic. The story, I believe, is apocryphal, but it serves its purpose as a warning quite as well as if it were true.

In spite of this warning, however, there are certain dynamical truths that we must not forget in considering our subject and which cannot be circumvented. One of the most important of these is that the weight increases as the cube, and the supporting surface as the square of any given dimension. To express this in popular language, if we have two flying machines exactly alike, except that one is on twice the scale of the other, the larger one will have four times the supporting surface of the smaller and about eight times the power, but it will also have eight times the weight. That is, per unit of supporting surface it will have double the power and double the weight. Its efficiency will, therefore, be diminished, approximately as $1\sqrt{2}$. In other words, it will be about two-thirds as efficient.

If a flying machine can now be built which will carry a total weight of 800 pounds forty miles, is it likely that in the future one of the same size can be built which can carry 1,200 pounds the same distance? If not, it is not likely that in the future we can build machines of twice the present dimensions capable of carrying eight times as many men, or an equivalent load of supplies.

The popular mind often pictures gigantic flying machines speeding across the Atlantic and carrying innumerable passengers in a way analogous to our modern steamships. In spite of our warning, it appears safe to say that such ideas must be wholly visionary, and even if a machine could get across with one or two passengers the expense would be prohibitive to any but the capitalist, who could own his own aerial yacht.

Another popular error is to expect enormous speed to be obtained. It must be remembered that the resistance of the air increases as the square of the speed, and the

work as the cube. If with 30 horsepower we can now attain a speed of 40 miles, then in order to reach a speed of 100 miles we must use a motor capable of furnishing 470 horsepower. This figure may be somewhat diminished by changes in the shape of the machine, and the angle of its wings, but it is clear that with our present devices there is no hope of competing for racing speed with either our locomotives or our automobiles.

Furthermore, if the speed of the flying machine does not exceed 40 miles, then the practical speed will be very uncertain on account of the action of the wind. Wind velocities in the eastern states at a short distance above the ground do not average far from 20 miles per hour. Therefore, when going in one direction we may expect a speed of 60 miles, but on the return of only twenty.

Another popular fallacy is to suppose that the flying machine could be used to drop dynamite upon an enemy in time of war. Dynamite cannot be applied in that manner. Unless it is tamped in some way, or forced into the obstruction by a projectile, its explosion would do little harm. If the air offered no resistance, the speed acquired by a projectile after dropping one mile would be 580 feet per second. With any practical projectile the resistance of the air would reduce this speed at least one-half, or to about one-tenth of the speed of a cannon ball, and one one-hundredth of its efficiency. It is safe to say that, considering the risk and expense involved, this would not prove to be a very economical method of attack.

In judging of the future uses of the flying machine, we cannot, perhaps, do better than to compare it with our various present means of locomotion. It will combine the independence of routes of the balloon with the speed of the automobile, with the uncertainty of the sailboat, and unfortunately with the danger which has no present equivalent.

There would seem to be but two practical uses to which such a machine could be put. One would be for scouting purposes in time of war, the other for sporting purposes in time of peace. If the danger proves to be not too great, all of its characteristics, except its uncertainty, will prove to be advantageous for both of these uses. How great the danger is can only be determined after several years of trial, and we shall then know if it is practically applicable to either or both of these suggested purposes.

A. M. HERRING.

I believe the aeroplane has reached the stage where it is practical as a means of transportation for human freight or to an extent equal to the average touring automobile, with possibly an extension in carrying capacity and size where it would safely transport as many as ten men on two hundred mile trips at speeds over fifty miles an hour. The prohibitive limit of speed is somewhere near 135 miles an hour. Even travelling at 60 miles an hour the power lost by an efficient screw is not over 5 to 8 per cent.

A machine can be produced in which the operator does not have to attend to the balancing and under this arrangement much heavier loads can be carried than is possible otherwise, both per square foot of supporting surface and per horsepower.

The regulating mechanism in my machine now being built will be unlike the description printed in a St. Louis publication and in the New York Herald. It is entirely new.

A machine can be made to think and act more quickly and with more accuracy than by human control.

The trouble with the machines flying abroad are their engines' overheating, for one thing. They are not very economical of power. They take two or three times as much power as they need. Their surfaces are incorrect and not presented to the wind at the proper angle.

BRIGADIER GENERAL JAMES ALLEN, CHIEF SIGNAL OFFICER OF THE ARMY.

Dirigible balloons have now reached a state of development that renders them essentially necessary to every well-equipped modern army. All first-class European powers are developing as rapidly as possible an aerial fleet. The United States, while it has done comparatively little in actual construction up to the present time, is in a position to make rapid development when the necessary means are provided.

It does not appear that any type of heavier-than-air machine has yet been developed to a point where it is of any particular value in war. The United States has contracts with two American makers who, it is believed, have developed the art to a point equal to or possibly beyond that reached in any other country.

As all other important nations are rapidly developing airships, the United States cannot well afford to be behind them. It is believed such vessels would also form a valuable military asset for purposes of coast defense.

JOHN H. MOSS, PRESIDENT AERO CLUB OF MILWAUKEE.

Patrick Henry said that it is natural for men to indulge in the illusions of hope. From time immemorial men have yielded to the power of fancy and in their dreams have lifted the veil of futurity while that divine artist, Imagination, with her magic brush and most brilliant colors, has painted a picture sublime and beautiful in which his ambitions have been depicted as realized. So far as aerial navigation, by heavier than air apparatus, is concerned, these hopes now seem near fruition, just as they were realized with balloons over a hundred years ago.

The pages of this magazine have kept pace in recording each new step in the experiments of aerial flight and there is no object in repeating what has already been told. But let me dwell for a moment upon the obligation this age owes to the world in promoting the solution of this great scientific problem and likewise upon the economic value of successful aerial flight.

We have gradually been subordinating the material world and obtaining a directive control over the forces of nature. The elements of fire, water and air are being made pliant to our will and have reached an advanced state of utility. We have subjugated both land and water, and, using them as instruments, are enabled to travel with almost incredible speed. Traditional ideas of limitations have been lost in the oblivion of advancement.

The railways, steamboats, telegraphs, telephones, and modern postal facilities have acted as gigantic centralizers. Those inventions which abridge distances have sealed the social and business unity of the entire country and made possible the marvelous industrial developments of recent times. I predict that in a very few years we will have gained entire command of the air and then both time and space must serve our bidding. Unification will then have been brought a long ways nearer completion and we will all be neighbors.

Like all efforts in new fields, the endeavors to navigate the air have had instances of failure and even disaster, for no endeavors have subjected man's ingenuity to severer tests, but after all, attempts at aerial navigation form a wonderful story of accomplishment. To climax our attainments with the successful control of the air would certainly challenge the admiration and commendation of even the most sceptical.

This is not an age which shirks the responsibility to advance the sum of human knowledge or to progress along those lines which make for the advantage of mankind. We owe it to ourselves, to the age in which we live, and to posterity, to solve Nature's mysteries so far as possible; to learn more of the utility of her resources and to vitalize her latent energies. The experience of our predecessors has descended to us, their acquirements are our heritage and it is our obligation to build a new round to the ladder of human culture and attainment so that our children may climb still higher and do the like.

We have been eminently successful in defying the dangers of wind and water, of tropical suns and arctic snows; we have successfully delved into the depths of the earth and scaled the highest mountain peaks. In all these achievements we have clung closely to terra firma; now it not only seems possible but highly probable that we will soon be soaring at will to aerial heights.

It is natural for one to ask: "What advantage will accrue to mankind should aerial flight be successful?" One may safely reply that there will be advantages from many view-points.

It will gratify an eager scientific inquiry.

It will satisfy a great world desire.

It will be an additional triumph toward man's dominion over the forces of nature.

It will afford an unlimited field for pleasure.

It will be a valuable aid to the study of atmospheric density, pressure and currents.

It will facilitate explorations.

It will be an invaluable help for army purposes.

It will add to the knowledge of propellor construction and adaptability if the dirigibles are operated in that manner.

There would seem no good reason why the same progress which has marked man's endeavors in other fields should not also be attained here. Theory and practice are waging a mighty contest and I confidently prophesy that the years are numbered in which theory will maintain its supremacy.

AUGUSTUS POST, SECRETARY AERO CLUB OF AMERICA.

The growth of the science and art of aeronautics in America is very interesting to trace, from the inception of the idea by a few enthusiastic members of the Automobile Club of America, to its present state of general interest and wonderful accomplishments.

We see its signs on all sides. No popular magazine is complete without a story either of scientific interest containing an accurate account of the very latest achievement, or an imaginative, dramatic, and thrilling narrative of what we may expect to happen in the future; such as aerial battles between airship navies of the great powers, or the "elopement by airships" to introduce the all-compelling love motive.

You may remember that at the first exhibition held by the Aero Club of America only three years ago there were exhibited only photographs and models of flying machines, heavier than air, three historic airships, and regulation balloons and equipment. These exhibits were the first real apparatus that many of us had ever seen. It was not long, however, before we had arranged a trial for the balloons as being the first step in the subject, and professional balloonists made ascents to show us how it was done. The next thing in the regular order of progress was to have ascensions by members of the Club, and then Mr. A. N. Chandler was sportsman enough to order a balloon himself. The rapid progress of ballooning from this moment was assured and a few of the members of the Club soon became expert pilots and are now engaged in rapidly initiating all who wish to enter into the mysteries of the skies. The second step in the progress is somewhat more slow of development and it would seem that the dirigible balloon or balloon with motor was just coming into the hands of the amateur.

"Chauffing" a dirigible balloon, although one of the most fascinating of all sports, has been rendered difficult to take up on account of the almost insurmountable obstacles in the way of obtaining suitable apparatus unless you make it yourself, and the fact that heretofore the ships available in this country have been built to carry one operator only, thus making it hard to instruct the novice in handling, and steering in the air. But now thanks to Captain Baldwin, Knabenshue, and others, who are building dirigibles to carry more than one person, they will be able to impart their knowledge and train many to successfully operate this form of vessel and we will ultimately see amateur airship races with all the excitement in the air of a Vanderbilt race on the ground; and if they could be seen over New York City itself, or over the Hudson River, there would be no necessity of the spectators getting up at sun rise or travelling out into the rural districts to see the fun.

The third step, which is even a greater one than either of the others, is the step from the mere photographs and models to the full sized successful flying machine heavier than air. This has also been taken although the last to come, in fact only just now really in our grasp. The heavier than air machine opens such fields for development that there seems no limit to what another year may bring forth. This dream of the past, this idea of the crank, this chimera of the illusionist, this greatest baffler of the inventor is realized. The one element that man has hitherto been unable to harness to his own chariot and conquer by force of will and might, has at last succumbed to the genius of the 20th Century and although the success of battle has already been heralded around the world, it is now in our midst. With our own eyes have we seen the marvel and with the moving proofs of the camera may we rest assured that just as we have had first the stories and dramatic pictures, then the models and apparatus, then the demonstrations and trials, finally as we have operated balloons and dirigibles ourselves, so will we soon guide and steer the flying machine.

The Aero Club itself has grown and matured, has made a reputation for itself and for America. It has stamped public approval and appreciation upon the work done by Professor Langley with the help of the War Department, and what the Signal Crops is now doing. With other Clubs following where it leads, the Aero Club of America must be extremely careful in this new and vast field beset with vagaries of all kinds. The direction of the Club itself among the varying trend of ideas now seeking to sway it first in this way, now in that, is much like the piloting of a balloon through the many diverse air currents, and when it has to deal with the more rapid progress and the tremendous forces brought to bear by the education of men to the quickness and rapidity of thought necessitated by the training received in power flight, and its vast commercial importance, there is all the more need to stand firmly together to consider quickly, wisely, and firmly that we may give full importance to all parts of the machine and guide it equally, not losing sight of the fact that we have a new problem never before presented, and for which we have been but partially prepared by the automobile and balloon, namely, the combination of the two, and we must steer both vertically as well as horizontally, and consider whether we shall avoid obstacles by going around them or going over them or under them.

JOHNSON SHERRICK, PRESIDENT AERO CLUB OF OHIO.

I have spent nearly all of my life in the business world, working hard in the channels of trade, and have only been able to look over the fences into the fields of science, and enjoy at long range the wonderful achievements of evolution.

We should be thankful that we are privileged to live in an age in which so much has been accomplished for the benefit and glory of man. If our ancestors of only a few centuries ago were able to look ahead and see the country in which they once lived, could they realize the change, or separate the picture from a passing dream?

The commerce that then went its way on the slow wheels of ox-carts, now speeds from state to state over steel roads at from twenty-five to fifty miles an hour carrying tons where only pounds were carried then. Then on water, sail boats loaded with freight, went with the wind and struggled long and hard to cross the sea. Now great ocean liners driven by the power of the steam engines cross and recross these same deep waters guided by the hand of man with little fear of wind or wave and at a speed not dreamed of in the earlier days.

Who would have thought not longer back than the days of our revolution that a battle on water in the middle of the Atlantic could be fought, and ere the smoke cleared away, the news of the result was being read by the people of all the civilized nation? And it has come to pass that the human voice can be sent thousands of miles through wire, and the familiar words of friends recognized at either end of the line.

When we think of the wonderful progress that science has made in electricity since the days that Benjamin Franklin first started the thinkers to think along that line. When we see the trolley cars speeding from place to place carrying their passengers seated as comfortably as our ancestors sat in their drawing rooms.

When we behold the motor car gliding through the streets and over the highways of our beautiful country. When we consider all this and much more in the fields of science (that seems to have no end), may we not expect and be reasonably certain that the navigation of the air is now assured?

The energy displayed by the Wright Brothers and other courageous workers have already done much toward navigating the air.

Science is lighting up the way, the brain of the inventive genius is hard at work, the skill of the artisan is putting the machine into shape, and the daring aeronauts and aviators are already riding the wind and guiding their crafts through the atmosphere. Nature is full of wealth. The land, the sea and even the air, is full of hidden mysteries which will in time yield such wonders that we of this generation cannot now imagine. Judging the future by the past we are forced to believe that not only aerial navigation is an accomplished fact, but in the future, and not far beyond, are greater wonders in store for the human family and grander events awaiting their place in the cycle of evolution.

We cannot estimate the possibilities of the future, but we can revere and be grateful to the men whose pluck and hard work have done so much for the world.

I am not a prophet but I know the scientific world as well as the physical world moves.

LEE S. BURRIDGE.

I desire to congratulate you on the anniversary of your publication Aeronautics, having now been issued one year, and particularly for the good work it has accomplished by creating a serious interest in the art which is all the more to be commended in view of the press of the country when you began referring to aeronautics in a sarcastic strain tinged with ridicule, which is now materially changed owing in a great measure to your serious efforts in the magazine.

The progress of the art has been greater within the past year than at any time heretofore and while this may not be due to your efforts entirely I feel that you have been one of the agents through your magazine, and while some believe that practical dynamic flight is at hand, I feel there is still a great deal of work to do to bring the present experiments to some useful practical purpose, so I commend you to keep up the good work you have so ably begun as there is still great development to be accomplished and all adherents look to you for the able co-operation and assistance you have so far given in the past to continue with redoubled efforts for the future.

HART LYMAN, EDITOR NEW YORK TRIBUNE.

Recent progress in aerial navigation not merely justifies but demands intelligent discussion of the development of the art and its possible application, both by the general press and by periodicals devoted exclusively to the subject, and I wish you abundant success in your interesting enterprise.

A. C. TRIACA, PILOT AERO CLUB OF FRANCE.

The year 1908 will not see aeroplanes carrying six people and dirigibles making sixty miles an hour, as some too early enthusiasts, not figuring out the theoretical difficulties of these aerial craft, have announced, but we will have records of five hundred miles with dirigibles at a speed ranging from forty to forty-five miles an hour and aeroplanes covering distances of one hundred kilometers.

These results will be the recompense of many years of study, innumerable experiments, and at great expense of brain and money and with loss of life. Today, aerial locomotion must get on a practical commercial ground and we need experienced and scientific builders rather than inventors.

We can leave to the natural inventive faculty of the very few, who, helped by scientists and practical experimenters, will obtain progressive work, the duty of perfecting the actual primitive airships.

The other believers in the close future of aeronautics must make an active and intelligent propaganda to interest the leading men in the social and financial world; must criticize the speculators and the self-called "aerial engineers" who losing their own lives and those of their companions who unconscious of the danger, accept to divide a cheap glory, are disseminating in the public opinion the idea that aerial navigation is perilous; and must incite the people to take up the matter with the brain and not only with feet and hands.

Your first year of work, my dear Mr. Jones, I am certain was difficult and misunderstood. I have read every page of your magazine with interest and I was pleased to see a steady progress every issue. If you cannot obtain until now a right and deserved profit, remember that your action will give you inestimable satisfaction, and that I am only one of your friends who admire the efficient help that "Aeronautics" is giving to the cause of aerial locomotion.

CHARLES W. KNAPP, EDITOR THE REPUBLIC, ST. LOUIS.

The increasing evidence that the problem of aerial navigation is at last approaching practical solution makes an occasion for a publication specially devoted to aeronautics such as has never before existed. The accomplishments of the past year have brought aeronautical experimentation more definitely into the domain of true science than could be said to be the case in past. Not only dirigible balloons but the heavier-than-air machines which enable genuine flying have made marked progress and we have every reason to anticipate notable developments in the year 1908.

F. L. LAIRD, EDITOR NEW YORK COMMERCIAL.

If your magazine keeps abreast of its subject, it would be one of the most widely read organs in the country within a generation. I believe warfare to be one of the least important phases of the problem of aerial navigation. Its realization now is assured and the step will count more for progress than did that from the farm buggy to the automobile.

H. J. WRIGHT, EDITOR THE GLOBE, NEW YORK.

I'd like to say something nice about the aeronauts in response to your request, because I am sure they are fine fellows, and they are certainly performing miracles. But what can a mere land lubber, now doubly derided by these that go up to the heavens as well as by those that go down to the sea, know of the bird men? Upon the tail feathers, so to speak, of the winged word presses the winged man; and who shall set the limits of his flight? Not, Yours Truly.

A. G. BATCHELDER, EDITOR THE AUTOMOBILE.

Reliable navigation of the air is close at hand. With so many bright and capable minds centering their attention upon a subject fascinating and spectacular, its practicable solution is presaged by the enormous progress accomplished during the past year. America is in the front rank, and may be counted upon to contribute substantially and successfully in bringing about aerial transportation. It must be confessed that much yet remains, but it must be likewise admitted that enormous strides have taken the science from the category of problematical things to the list of assured realities.

F. W. MAIN, SPRINGFIELD REPUBLICAN.

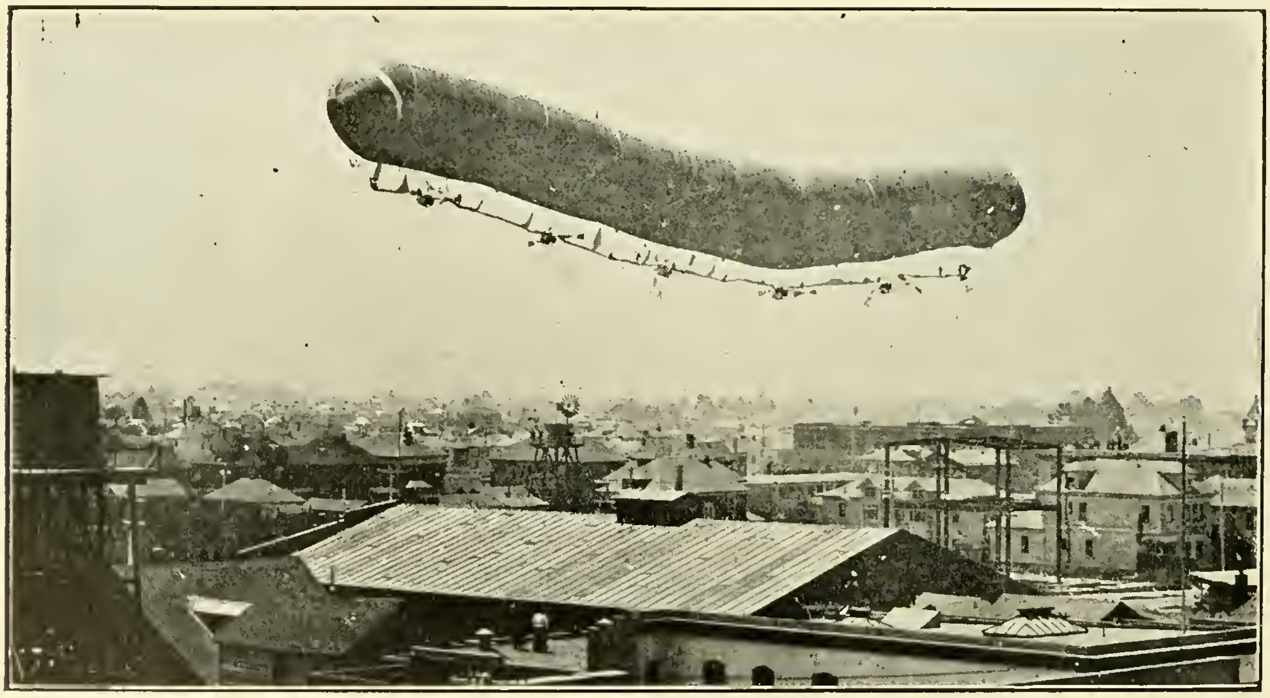
The Republican has for years believed in the utmost encouragement of all scientific efforts to navigate the air and has had faith that results of great importance to man-

kind would ultimately be secured. The progress made in the past five years in the several lines of aeronautics cannot be contemplated without having one's faith quickened and one's imagination stirred. While there must be much uncertainty as to the scientific limits of practical, especially commercial, dynamic flight, still the world seems to be merely on the threshold of developments whose scope we can now only vaguely discern. The world already owes a large debt to the men who have pushed experimentation with flying apparatus to its present limits, and before their pioneer work is ended the debt will be great indeed.

CALIFORNIA AIRSHIP COMES TO GRIEF.

An enormous dirigible balloon, 450 feet long and 36 feet in diameter, and 485,000 cubic feet of gas, built by the National Airship Co., (see page 37 of February——page 43 of April) with sixteen passengers, attempted a flight on May 23rd at Berkeley, Calif. Six gasolene motors generating 200 horsepower were suspended beneath the gas bag at intervals of about 50 feet. As the dirigible rose into the air to a height of about 300 feet, two of the engines were started. The front end tilted sharply downward and the rush of gas towards the rear caused the envelope to burst open. The airship dropped rather slowly but the excited occupants jumped out and all were more or less injured, though none fatally.

The prospectus issued by the company in 1907 is fearfully and wonderfully written. On the cover of this optimistic pamphlet is a supposed "reproduction" of the good ship "Ariel," stated to be "1250 feet long, 64 feet diameter, 140,000 cubic yards capacity, 128



Scientific American Photo

tons displacement, 8 independent power plants, 3280 actual horsepower, 16 propellers. Ships 40 men in the crew and will carry 500 passengers and 40 tons of mail from New York to London at an expense of $875 in 24 hours."

The officers are given as: J. A. Morrell, President and General Manager; M. Sparling, Vice-President; S. LeMaster, Assistant Manager; W. O. Backman, Secretary. The capital $10,000,000.00.

The prospectus calls for landing docks on the tops of office buildings which the ambitious company proposed to erect in all the large cities of the world.

The inventor claims to have begun "riding gas vessels with eminent meteorologists and topographers who worked under the auspices of the Smithsonian Institute, in the study of the dynamics of the atmosphere." * * * * "Since then he has built 17 so-called airships and over 6000 gas balloons by contract." * * * * "Each airship will earn over $25,000 per day. We will carry the passengers of the world, the mail of the world, we will build the navies of the world." Stock in this enterprise was offered at 75 cents a share.

The prospectus which this human prodigy Morrell has circulated is the very wildest dream that the world's most prolific liar could by any freak of imagination produce. This little effusion of Morrell's should go down in history as the greatest impressionistic picture the world has ever known. No ordinary mortal could spur Pegasus to any such height in the realm of thought.

And yet when it was reported in the February issue, that the Post Office Department was investigating the concern, a stockholder promptly took us to task, as per his letter in the April number.

The airship which is the subject of this gentle description is the second one which this company has perpetrated. The first was launched last Fall and promptly broke away and was partially or wholly destroyed.

In writing of the first airship, a well known gentleman of California said:

"From what I could learn, it seemed to be a 'stock' proposition based upon the visionary ideas of an enthusiast and I did not even take the trouble to go to see it, although I frequently pass near its location. I contented myself with inquiries. From one who saw it, I learned that the gas bag was extremely long and there were six propellers placed at the sides. However, as it has succeeded in at least causing a little fuss, I shall try to see the remnants, as I intend to pass that way in the near future. * * * * * I wish to caution you aeronauts of the East not to be surprised at anything of a grand scale in California. Our earthquake and fires are big, our mountains and trees are big, our pumpkins and suckers are big, and our frauds and liars are big. * * * * Apropos to this latest venture, you will see from the clipping that 500 of us were about to hurl ourselves in 24 hours across the Continent. But this thrilling trip is deferred and the '400' of New York can breathe easy and feel secure, for a time at least, from the impetuous assaults of the 500 'wild and woolly' Californians."

N. Y. World Photo.

After this gentleman's visit to the National Airship Co., he wrote as follows:

"In South San Francisco, on the south side of a hill, notoriously the most windy portion of the city, I found a tent 20 by 25 feet in charge of a keeper who was very reluctant to talk to me when he learned who I was. In the tent were ten fan wheels 16 feet long, containing two blades made of oiled silk, stretched on two rather heavy pieces of wood, crossed at the center. These were fastened to a shaft about 6 feet long, having a bicycle wheel at the other end intended to receive a belt. And the whole was attached to a light frame, designed to extend from the main frame of the ship. Outside of the tent was a strip of level ground about 400 feet long. At one side there was a triangular frame of steel tubing, 1 inch in diameter. The tubes were about 24 inches apart. There was a 6 inch gas main to deliver the city gas for inflation. This gas is usually very heavy, being made from petroleum and steam."

"The keeper referred me to the office in the city. I called on the inventor but unwittingly told him who I was and got very little information. He gave me his circular; and answering my final question, told me his airship would travel 150 miles per hour."

"I am sending you his circular—it will certainly drive away the blues or refresh your weary mind to see the delicious pap that our artistic liars can deal out to the guileless 'suckers.'"

A. C. Triaca in his speech of condemnation at the Aero Club strongly urged that some action of the club be taken to express its disapproval of the risking of other peoples' lives by foolhardy inventors. He called it "criminal."

Certainly there ought to be some law which would protect innocent speculative lambs from being cruelly taken into the air and then chucked overboard in addition to being fleeced. Suppose we must have a certain number of fatalities in order to get the art going in good shape but there would be no harm in limiting the height from which a stockholder can fall or demanding that he drop at only such and such a speed or specifying that he shall break but one leg.

F. A. Postnikov, late Lieut.-Col. of the Russian Army, member of the Aero Club of America, said: "I feel that the ship Mr. Morrell is building is unsafe. To take a crew of men up in this would be to jeopardize their lives. My reason for saying this is not to discourage his crew, but from a scientific standpoint I am convinced that the canvas used to envelope or confine the gas is not strong enough to hold the volume of gas that will be forced into it. The greater the volume of gas the greater the buoyancy, and likewise the greater the pressure upon the bag confining it. With half a million cubic feet of gas confined, you can readily imagine that the pressure will be enormous. The quality and texture of the material used in this great bag would do for a smaller craft but as it is increased in size the strength of the texture must be increased."

There are three theories by which those who witnessed the accident attempt to explain the reasons for the catastrophe.

When the gas cylinder began to rise and after the forward part or bow of the airship was about 100 feet from the ground it was noticed that one of the engines appeared to sag down, depressing a part of the gas holder, as if the engine had been improperly placed or was not securely fastened. The first theory advanced is that this unworkmanlike arrangement caused a derangement of the equilibrium, which led to a bursting of the cloth covering, and that the collapse was inevitable.

Another story is to the effect that a guy rope had been carelessly thrown across the network of small cords that bound the gas holder, and that when drawn taut by the ascending balloon cut through the cloth and allowed the gas to escape with a rush that proved fatal to the experiment of inventor Morrell. This guy rope had not been cast off simultaneously with the others, and thus caused the accident, it is said.

A third suggestion comes from those who declare that they noticed that the forward part of the balloon was inadequately inflated, that the canvas of the bag flapped about in a flabby way, and that the tension on the guy ropes was unequal, thus leading to an improper distribution of the weight and causing the entire balloon to collapse.

A. Leo Stevens, in speaking of the accident, said: "It is no more than can be expected. Take into consideration the number of people who have conceived the idea that they can get money by getting machines together that won't fly without having had practically any experience at all and have never been into the air—what they have done is for the sole purpose of defrauding people out of their money, claiming that they have solved the problem of aerial navigation and offer stock for sale. No man should try to build a dirigible balloon under any account unless he has some experience in the air and he should be careful to select some man who holds a pilot's license, as there are several now in this country and he will be safe in their hands. The country is over-run with hot air aeronauts who have had practically no experience and do not even know what takes them into the air. Some of them claim even that birds manufacture hydrogen gas under their wings. If this building of air castles continues certainly many will be injured. There should be a law. If the Aero Club of America would devote more time to bringing this matter before the legislatures instead of reading aeronautic picture books there would be more done and it would be a great deal safer. Ballooning is a safe sport and there is no doubt but that in a few years we will cross the Atlantic Ocean in a dirigible but not by the people who have never been in the air."

More Accidents.

Lieutenant Fonseca, who is known all over the world as a famous balloonist, was killed during a demonstration at Rio de Janeiro on May 21st.

Dispatches state: "The lieutenant came from France recently with a balloon to demonstrate its usefulness in military affairs. Before the Minister of War and a large number of officers, the initial voyage was undertaken.

"Fonseca had entered the car, making preparations for the flight, when a gust of wind swept the big gas bag free and it shot upward. At a height of 3000 feet it collapsed and pitched to the ground."

The balloon is probably the one of which we told in the March number. Louis Godard, the balloon constructor, shipped to Rio Janeiro a military captive balloon outfit equipped with an arrangement for the continual manufacture of hot air, by which ascensions lasting several hours can be made with hot air balloons.

C. A. McCormick, a hot-air-balloon-parachuter, narrowly escaped death in a jump at White City, Fort Worth, Tex. As he cut loose from the balloon in his parachute, the latter was ripped and he descended in record time, turning a complete revolution during the descent. The man hung on and landed safely, though somewhat injured. The height was estimated at 2000 feet.

Frederick L. Woods, a parachute jumper, lost his life at Hillside Park, Belleville, N. J., on May 31. The ascent was made without incident and the parachute cut loose from a height of a thousand feet. An American flag which was unfurled by Woods during his descent, became wrapped around him and on landing in the Passaic River prevented him from freeing himself from its folds. He shouted for help to the spectators but all seemed to be stunned or did not realize that he was calling for help. His life was lost through the negligence of the sightseers and the fact that he was tightly wrapped in the flag.

WHAT THE AERONAUT CAN DO FOR METEOROLOGY.

Government Ascension Blanks for Aeronauts.

The balloonist can be of the greatest assistance to the Weather Bureau by making complete records of his trips and sending them to the Weather Bureau for study. Aeronauts can hardly expect the meteorologist to tell them beforehand what upper winds and temperatures to expect on a given day unless they furnish from past voyages the material that is needed for such predictions. An aeronaut is but helping himself when he sends the Bureau copies of his records, since he is sure to receive in return items of valuable knowledge generalized from numerous other corresponding reports. We beg you balloonists to read Professor Abbe's article on "What the Aeronaut Can Do for Meteorology" in the April number of this journal.

Nearly all ascensions are now made only after receiving advice from the various stations of the Weather Bureau, but at present little can be told except the surface conditions. To forecast conditions in the upper air the Bureau must have some data upon which to base predictions, and it is only from the enthusiastic balloonist that it can obtain this data.

The matter of the Bureau co-operating with balloonists was urged by this magazine months ago, and later we suggested to the Bureau that they furnish the proper blanks free of charge to all those who will use them in recording their ascents. Within this month these forms have been printed and are for distribution from the Weather Bureau at Washington direct, or from this magazine.

Following will be found some general instructions for recording observations in the balloon and at the surface:

The observations of pressure, temperature and relative humidity should be made as nearly simultaneously as possible, at intervals of about 15 minutes if the balloon is floating at nearly the same height, and as often as possible if it is rising or falling rapidly. With the temperature and the vapor pressure along the air column from the surface to the balloon, the height can be computed at leisure.

Notes on clouds should specify whether they are of the heavy cumulus type, or of the light stratus type, also, any special changes of temperature observed in passing through the cloud layer.

Corresponding observations of pressure, temperature, relative humidity and wind should always be secured at the surface, at nearly the same moment as the observations in the balloon, these two sets of observations being always essential for any scientific discussion of meteorological data.

In one section of the form traces of the self-registering instruments can be drawn on any convenient scale, also a small chart of the country over which the balloon has traveled should be added.

If balloonists will mail copies of their observations to the U. S. Weather Bureau, to Aeronautics, and to such aero clubs as are interested, it will facilitate the discussion of their results.

The Creedmoor rifle range, which was in mind for an experimental ground, has been turned over to the State Lunacy Commission for a hospital site so that there is still some hope that we may at last locate somewhere on the grounds.

AERO CLUB OF AMERICA
12 EAST 42ND STREET
NEW YORK

ORGANIZED 1905

First Aero Club in the United States

IT is the National representative and member of the International Aeronautic Federation which consists of one representative Club from all of the leading countries of the world. The Aero Club of America has entered three balloons to represent America in the Gordon Bennett International Balloon Race at Berlin in October, 1908.

With the Aero Club of America are affiliated the leading Aero Clubs of the country, namely: Aero Clubs of St. Louis, Ohio, New England and Milwaukee.

OBJECTS:

The promotion of a social organization or club composed in whole or in part of persons owning aeronautic inventions for personal or private use. To advance the development of the science of aeronautics and kindred sciences. To encourage and organize aerial navigation and excursions, conferences, expositions, congresses and races.

OFFICERS:

President, Cortlandt Field Bishop; 1st Vice-President, J. C. McCoy; 2nd Vice-President, Colgate Hoyt; 3rd Vice-President, Alan R. Hawley; Secretary, Augustus Post; Treasurer, Chas. Jerome Edwards; Consulting Engineer, Charles M. Manly.

I desire to become an active member of the Aero Club of America.

Proposer.. ....

Seconder.. ....

AERO CLUB OF AMERICA.

The regular Monday night gathering was treated right royally on the 18th.

A. Holland Forbes, one of the newer members of the club addressed the meeting, giving a resume of his experiences in his recent balloon trips in qualifying as a pilot of the Aero Club of America.

He dilated upon the pleasures of ballooning and told how he became enthused by reading a description of the delights of the sport in some magazine and immediately hunted up Leo Stevens. Beginning his talk, Mr. Forbes paid his respects to his tutor as being "without an equal."

The first trip was from Pittsfield in the late Fall of 1907. Charles J. Glidden, the international motorist, telegraphed Mr. Forbes at Pittsfield inviting him to land in Boston Common and dine with him. The Boston Herald printed in a prominent place, in "scare-head" type, "Forbes to Land on Boston Common." The crowds that gathered in expectation of seeing this improbable event had to be dispersed by the police. A storm had been brewing in the North and the balloon drove rapidly to the South. The pilot, Mr. Stevens, went up to 15,000 feet but could find only a wind from the North. Coming down to about four or five thousand feet they ran across an eagle which followed the balloon for half an hour in which time they travelled about fifteen miles. The eagle "never flapped its wings" but just curved the tips in circling 'round. The landing was made near Orange, Conn., and the farmers stated the last mile was travelled in twenty-eight seconds. The following day the Boston Herald printed the following: "Missed Boston by 140 Miles."

Mr. Forbes continued, telling of the principal points of interest about each of his trips. In the second trip nine snowstorms were encountered and at times the balloon dropped so swiftly that the flakes seemed to be falling upward.

The fourth trip was made alone from North Adams in the "Stevens 22." A gale was blowing and the balloon bounded back and forth on the ground. At last in a lull the small army of men let go and the balloon left in a hurry, and was out of sight in two minutes. The start was at 11:25 a.m., and the Northampton railroad station was passed at 12:15, forty miles in fifty minutes. Clouds were passed through several times. Once on looking up, the huge bag could not be seen—the ropes went up and disappeared in the thick mist. One can imagine the uncanny sensation of being alone in the chilling clouds with nothing visible around, above or below, but the basket and ropes. On two trips the balloon started east but met counter currents and then returned almost in the opposite direction.

The night trip necessary to complete the pilot's course was made on April 11th. If the start were made at dusk the landing would have to be made in the middle of the night in darkness, the distance to the sea being only a hundred miles or so. It was decided to start in the night and at twelve midnight the inflation was commenced, with the aid of the acetylene lights of two motor cars. By three a.m., the inflation was finished and the start made. Even at this early hour several hundred people were present.

The tenth trip necessary for a license was made on April 24th, in company with N. H. Arnold and Dr. R. M. Randall of the North Adams Club. The balloon started toward the east but met a counter current and drifted back towards North Adams. The wind was light and the landing was made near South Williamstown, Mass. Mr. Forbes forgot to be as insistent as his preceptor in cautioning the passengers not to leave the car at the moment of landing, and just as the basket struck Randall leaped out, Arnold fell out and Forbes tumbled in the bottom of the basket and the balloon shot up to five thousand feet. As soon as Mr. Forbes recovered himself he looked to see that the two passengers were safe. The next important thing was to get down again—without ballast to lessen the shock of landing, it having already been completely used. At last the balloon began to drop but the wind drove it along so that the landing was accomplished without accident.

The attempt to win the Lahm Cup, starting from St. Louis, had been postponed till Fall when steadier winds can be expected.

The gas furnished at North Adams has been particularly light and, on one trip, was able to lift forty-eight pounds to the thousand cubic feet.

A telegram was read from the Aerial Experiment Association at Hammondsport, stating that the second aeroplane of the Association had made a flight of ninety-three yards at a height of about ten feet.

B. R. Newton, of the New York Herald, was called upon to tell of his trip the previous week to Kitty Hawk, N. C., where the Wright Brothers have been conducting their experiments. The story was one "the like of which had never before been told," and the assemblage sat spellbound while he described how he saw the machine rolled out of its shed, the propellers start and the machine leave the ground for its flights of miles at a time, over and around the enormous sand dunes of the Atlantic coast.

To attempt to report the wonderful tale with the strength imparted to it by Mr. Newton would be futile and we leave it for Mr. Newton to tell himself elsewhere in this issue.

Mr. Newton ventured to assert that he believed that the secret of the Wrights' success was to a great extent due to their training and ability to instantly balance the machine when struck by gusts, and that in the future every aviator would have to learn the same lessons. Mr. Herring took objection to this, stating that the Langley model maintained perfect automatic equilibrium and that his own gasolene driven model had flown for fifteen minutes at a time, maintaining perfect automatic stability.

Mr. Kimball, the Chairman of the Entertainment Committee, told of his recent trip to Hammondsport and asked Captain Baldwin to tell of the dirigible which he is building for the Government but Captain Baldwin facetiously declined on the ground of "Government secrets."

On Monday evening, May 25th, Augustus Post told of his trip to Hammondsport and seeing fly the White Wings of the Aerial Experiment Association.

A. C. Triaca brought up the subject of the accident in California, in which sixteen people were injured in the attempted flight of the "Ariel" and denounced the allowing of inexperienced men to make ascensions and without having the balloon or airship examined for its safety. It is to be regretted that his motion was not put to a vote and the action made a matter of record for the future.

New members elected: Thaddeus Gray, A. P. Warner and Edward B. Kinsila.

Resigned: Philip T. Dodge.

CLIMBING MT. WASHINGTON.

This picture was taken in the olden days, when automobiles were the vogue. Mt. Washington is near Bretton Woods, N. H., at the junction of the Seabreeze and St. Lawrence Currents, just above the mountain walled valley of the Ammonoosuc and the two great mountain hostelries, The Mount Pleasant and The Mount Washington. Back in June of 1908 the Automobile Club of America, now long extinct, had an automobile tour from New York to these two hotels and return. Perhaps the oldest inhabitant will recall the circumstances.

ARMY NEWS FOR MAY.

On the 13th inst. an ascension was made in the Signal Corps Balloon No. 10 for the purpose of making experiments in wireless telegraphy. The details are given under the list of ascensions for the month.

An ascension was made in the same balloon on the 26th for the purpose of training the personnel in the use of a free balloon. This is also reported in the list of ascensions.

During the past month a hydrogen plant was set up by the balloon detachment at Fort Myer, Va., and enough hydrogen generated to fill Signal Corps Balloon No. 9, which is now being used for the purpose of training the balloon detachment in captive balloon work.

New Captive Balloons.

The specifications for two captive balloons of 1000 and 540 cubic meters capacity, bids for which were opened on April 29th, and award made to Capt. Thos. S. Baldwin on May 7th (see the May number) call for the following requirements:

The fabric must be of American manufacture made by rolling together two layers of silk having a layer of rubber between; weighing approximately 5 2-3 ounces per square yard for the smaller balloon and 7⅛ ounces per square yard for the larger balloon.

The envelope to be constructed with panels, so arranged that the seams may be continuous in horizontal direction but not continuous vertically. The seams will be made gas-tight by a light strip of silk covering the seams inside and out attached with rubber cement.

For the larger balloon, the gas bag will be provided with a manoeuvering valve of the clap type at the top and a wooden neck ring and sleeve at the bottom, both of which shall be easily removable from the gas bag, there being no wooden parts permanently attached to the gas bag.

For the smaller balloon, the gas bag will be provided with a manoeuvering valve for the top, and at the bottom an adjustable emptying valve, which will release the gas at any desired pressure. Both of these valves shall be easily removable from the gas bag, there being no wooden parts permanently attached to the gas bag. There will also be provided a neck ring and sleeve with appendix ropes, so that this balloon may be used for free ascensions as well as captive.

Around the top and bottom openings the gas bag must be reinforced with an additional thickness of fabric. There must also be provided a ripping panel, the length being one-eighth the circumference of the balloon.

The sizes of valves, length and diameter of neck, sleeve, etc., will conform to the regulations of the International Aeronautic Federation for coal gas balloons.

There will also be provided for these balloons, net and suspension of Italian hemp, the net to be of the diamond pattern. There will be provided with the nets a suitable concentrating ring, equipped with toggles for attachment of the suspension lines.

These balloons will be inflated with hydrogen and therefore the strength of the net and suspension must be proportioned accordingly.

The manufacturer does not supply basket, anchor, anchor rope, guide rope or any car fittings. The manufacturer does supply, however, the rope for maneouvering valve and rope for ripping panel.

Tent for Housing Dirigible.

Advertisements have been sent out for a tent to house the dirigible now being built for the Government by Captain Baldwin, the dimensions of the dirigible being 105 feet in length, 21 feet maximum width and 31 feet maximum height.

The free space inside the tent must be at least 120 feet long and 30 feet wide to a height of 31 feet. One end shall be so arranged that it can be completely opened. The ropes and guys which might chafe the balloon must be on the outside of the canvas. The material shall be about 10-ounce duck or other suitable material and shall be mildew proofed. The tent shall be arranged so that an additional section may be inserted to lengthen it. Manufacturers shall submit a detailed plan showing the dimensions, shape and construction of the tent they propose to furnish. The tent is to be delivered at the "Balloon House, Fort Myer, Va.," and will be accepted only after being set up at the place of delivery.

After three years of studies, the Italian staff will have its first dirigible, and it is now almost finished in the aerostatic park of the engineers at Bracciano. Its dimensions are about the same as La Patrie. The construction was supervised by Commandant Moris, Captain Ricaldoni and Lieut. Crocco. In all probability, by the first of July the dirigible will leave its shed at Bracciano and go to Rome.

MAY AEROPLANE FLIGHTS IN EUROPE.

The last part of April was windy and no flights were made.

On the first of May Farman brought out his No. 2, which is the old one refitted. A new tank of water has been added which will allow him to fly for 20 minutes. The Continental caoutchouc covering for the planes has proved most satisfactory. It gives some stiffness and is not affected by the hygrometric condition of the atmosphere. The machine has also been fitted with two seats, and the aviator has been overwhelmed with requests for "a ride."

Repairs to the Bleriot VIII. are finished, and he is to resume trials now.

On May 2d Farman and Delagrange were out for the Armengaud prize for 15 minutes in the air. After a few preliminary rolls Farman started easily, but the rear wheels would touch the ground on the turns. Later in the afternoon he tried again and succeeded in getting over 500 meters of ground, but the wheels touched again in ending a turn into the wind. In the following attempt Farman makes a circle of Issy les Moulineaux field. At the last minute allowed under the rules Delagrange made a last attempt, his flight followed by the official timers in an automobile. At a height of 3 to 4 meters from the ground he tried to turn to the left, but the wind visibly embarrassed him and in spite of the rudder he failed to fully correct his course, and passed close above the heads of the spectators massed before the sheds, but the oil tank failed with its supply, and the speed lessened. Almost hitting the people, the right wing brushed against a taxicab, and Delagrange fell forward on his hands. His flight lasted 50 seconds and the distance covered was about 1,200 meters.

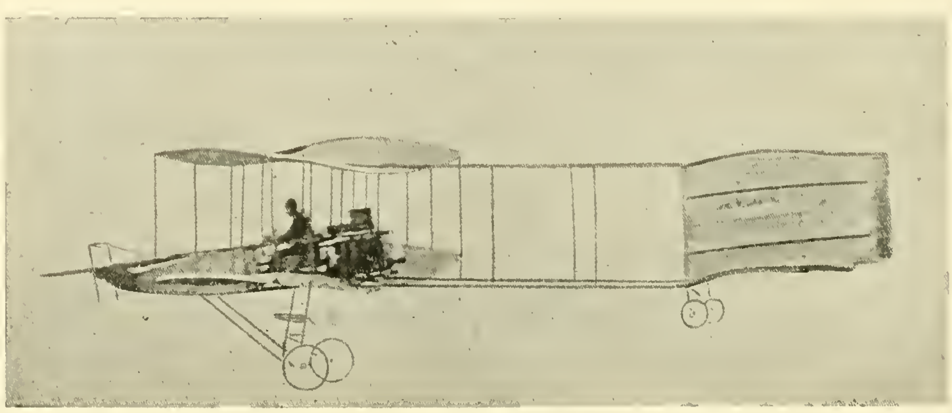
The Gastambide-Mengin monoplane-aeroplane was out on the same day at Bagatelle. The body has been lengthened by 2 meters. They were satisfied with having the machine roll swiftly over the ground.

At the invitation of enthusiasts in Italy, Delagrange went to Rome, and on May 24th made several flights before the Minister of War, Major Moris, officials, and about 30,000 people gathered on the Place d'Armes. On the third trial 200 meters were covered at an altitude of 1 meter. The fourth trip was lengthened to 400 meters, the fifth to 450 meters, including a turn at 2 meters from the ground, and finally, in spite of the wind, he made a flight of 1,800 meters.

On the 25th Farman began his trials at Ghent, Belgium, where he had gone at the request of the Aero Club des Flandres and the City of Ghent. He made flights of from 100 to 300 meters at about 3 meters from the ground, but the wind was adverse to his trials.

On the 27th he flew before an enormous crowd, but made only 80 and 440 meters, respectively, at a height of 3 to 4 meters.

At Ghent the field contained 140 hectares, being 2,000 meters by 700 meters, and admirably adapted to his experiments. The trials were scheduled to occur from 2 o'clock to 7 o'clock, and, like the camp meeting, "weather permitting."



DELAGRANGE IN ROME.

Delagrange Beats All Previous Foreign Records—In the Air 9 Minutes 30 Seconds Without Touching the Ground.

On the 27th of May Delagrange made a new record for Europe and beat his own record of April 11, at Issy, when he covered 3925 meters officially (see May "Aeronautics"), and stayed in the air 9 minutes 15 seconds.

The King of Italy was present and saw the flight.

The cable sent "Les Sports" from Rome read as follows: "This morning at 7:20 Delagrange effectuated a number of flights before the King, the Queen, General Brusati and other personages of the Court.

"The longest flight reached about 9 kilometers, the aviator remaining 9 minutes without touching the ground at a height varying between 1 and 3 meters. The second flight is estimated at 5 kilometers."

On the following day, the 28th, in the presence of about 4,000 people, Delagrange made a new success, accomplishing flights of 2 and 3 kilometers at a height of 2 to 5 meters.

Farman on the same day, at Ghent, made a flight of 1,500 meters. About 10,000 people were present.

The great steps of aviation in Europe can be summed up as follows:

Oct. 23, 1906—25 meters of Santos Dumont at Bagatelle.

Oct. 26, 1907—770 meters of Henry Farman at Issy.

Jan. 13, 1908—1,000 meters, Grand Prix Deutsch-Archdeacon, won by Henry Farman at Issy.

Mar. 21, 1908—2,004 meters of Farman at Issy.

Apr. 11, 1908—3,925 meters; record of distance, 6 minutes 30 seconds, Delagrange, at Issy.

May 27, 1908—9 minutes 30 seconds, record duration, Delagrange, at Rome.

THE WILLIAMS HELICOPTER.

Mr. J. Newton Williams, of Derby, Conn., with his full-sized "flyer" of the helicopter type, is at the experiment station of the G. H. Curtiss Mfg. Co., Hammondsport, N. Y., where some interesting experiments and tests have been made.

The machine has two superposed propellers, in horizontal parallel planes, mounted on concentric hollow shafts, revolving in opposite directions, and driven by an 8-cylinder, 40-h. p., air-cooled Curtiss motor.

In private trials this machine has developed a thrust of over 500 pounds, and on one occasion it lifted a light weight man clear of the ground. This trial was abruptly ended by the springing of a shaft. The shafts and transmission have developed some weakness (having been designed for a motor of less horsepower), and are being replaced by heavier and stronger parts. It is expected that the machine will be ready for further trials soon.

Mr. Williams, who is the inventor of the Williams Typewriter and the Automatic Bank Punch, has been a student of aeronautics for many years, and some of his private laboratory work fully demonstrated to him the great possibilities of mechanical flight, and gave promise of present results, even before he commenced the construction of a helicopter of man-carrying size.

The Herring Government Aeroplane Nearing Completion.

Work is progressing on the aeroplane which A. M. Herring is building under contract for the U. S. Army Signal Corps. June 1 was the date for filing the bond, and Mr. Herring went to Washington on that day.

Details of the machine are being kept secret to a great extent, but we have reason to believe that it will be of the Herring-Chanute bi-plane type, the planes 27 feet wide by about 3 feet from front to rear, and 4 feet between the upper and lower surfaces. There are to be eight uprights spaced variably. There will be more than two propellers, placed in front.

The two engines have been specially designed by Mr. Herring: 5-cylinder, 4-cycle, air-cooled, forced lubrication, make-and-break ignition, and weigh each 22 pounds, including carbureter, oilers and igniters. With a maximum of 17 horsepower for each motor, the weight per horsepower is 1.29 pounds. One motor will be situated each side of the two occupants.

Carl Hartman Model Makes Successful Flight.

At the Stevens balloon factory last week the small model aeroplane of Carl Hartman made a flight of 400 feet at a height of 6 feet. The model weighs ¾ pound and lifted 3 ounces in addition to its own weight. The power is supplied by a rubber band. The supporting surface is 1 square foot. The two propellers are in front. The planes and motor are tilted up and down without changing the level of the frame of the model. The flight was very straight and flat. It was found that it took more power to get up than it did to keep going on a level after reaching the desired altitude.

AMERICA'S FOREMOST AND MOST FAMOUS AERONAUT, CAPTAIN THOMAS SCOTT BALDWIN.

Austin Gregory.

Captain Baldwin is today at the head of his profession, and there through hard work and constant application during the past thirty years. He has won, and rightly deserves all honors bestowed upon him.

In years gone by, when but a mere lad, he gave up everything in all lines to devote his life to the science of aeronautics. In those days it was not like it is to-day, where one man can pick up what another has accomplished and use it, but all Captain Baldwin had to learn and work from was practical experiments and experience of his own.

CAPTAIN THOMAS SCOTT BALDWIN.

When a tiny babe Captain Baldwin's parents died, leaving him to fight his own way in the world, which we all know he has accomplished with success. When he was old enough to carry papers, he became the proud possessor of a newspaper route. When a little older he advanced to a gas-lighter. From a gas-lighter to a book canvasser. From a book canvasser to a gymnast, and he remained in the profession for years; but before leaving it brought out a new attraction by going up in a hot air balloon and performing on a trapese during the ascension. This was his strong card, but he tired of that, and sought something more thrilling.

During 1885, when on a western trip to San Francisco, he spied at the Cliff House the new feat that he was looking for; that was to stretch a wire from the Cliff House to the Seal Rocks and walk back and forth. This wire could not be properly guyed, but, nevertheless, every Sunday afternoon found Thomas Baldwin walking on a swaying wire ninety feet above the dashing bounding waves, half the time covered with spray. This feat has never been accomplished by another though it has been tried.

From the "Cliff House act" Captain Baldwin went to captive ballooning. There being too much sameness to this, he decided to invent a parachute whereby he could jump from a balloon. Up to this time there had never been a successful parachute jump, as each attempt resulted in a death; the last accident occurring about fifty years previous to Captain Baldwin's first jump. The first parachute was tried out in the old Mechanics' Pavilion in San Francisco—first by attaching sand bags to it, and then by Captain Baldwin himself.

After several trials Baldwin was so sure it was perfect that he was willing to make a jump of a thousand feet from a balloon and, while waiting the opportunity, called on the Street Car Company terminating at Golden Gate Park and told them of the wonderful invention and great drawing card that he had, saying he would be willing to jump from three hundred and fifty to a thousand feet at a dollar a foot. That was all very well to tell about, but it was something so unheard of that it needed consideration, and he was told to "call around in a few days." He called and was told they had decided to take a thousand feet at a dollar a foot. Bills were posted and the wonderful jump was the talk of the day, as nothing like it had ever been attempted before.

Fully thirty thousand people congregated at Golden Gate Park to watch the foolish man jump to his death, and at 2.15 in the afternoon, January 30th, 1887, Captain Baldwin made the first successful parachute jump on record. For a couple of years Captain Baldwin never used the same parachute twice, though he was continually taking jumps; for after each trip he could see where some improvement was necessary, or that ropes must be tightened or loosened, or he would make a large hole, then a small one in the

top to try to stop the frightful oscillation, and he was never known to ever use a basket, or to be tied in any way to the parachute, but went up by simply holding to the bar by his hands. Heretofore parachutes had been made rigid, but Captain Baldwin's success lay in the fact that his was limp. He never jumped from a hot-air balloon, but always used gas.

Up to this time Captain Baldwin had accomplished three of the most hazardous and thrilling feats ever attempted by mortal, viz.: going up in a hot-air balloon, giving a performance on a trapeze during the ascension; walking on a wire from the Cliff House to the Seal Rocks, a distance of seven hundred feet, and ninety feet above the water—this was considered the most daring feat ever attempted, and it made Captain Baldwin famous; the third was leaping from a balloon at a thousand feet with the aid of a parachute, something never accomplished before in the history of the world. Captain Baldwin at that time was but 23 years of age.

Captain Baldwin immediately began to travel with his parachute, giving exhibitions in the various large cities. Here is an extract by Judge Carter from a Quincy paper after an exhibition in that city:

"Quincy, Ill., July 22d, 1887.—The feat performed by you on July 4th in the presence of thousands of our people and their guests, has with one voice been pronounced the most daring of its kind ever attempted by any man. Its attempt was abundant evidence of your courage and devotion to the science of aeronautics. Its signal success was equal proof of your skill in your chosen field of investigation and discovery.

"The countless ships that shall sail with electric speed throughout the trackless air in the twentieth century, laden with human and commercial freight, may owe to the discovery of Thomas Scott Baldwin the principal that shall insure their triumphant success. Their hosts of passengers may pursue their aerial voyage with the ever-present restful thought that Thomas Baldwin has provided a safe descent to Mother Earth in times of accident or peril." He was then presented with several jewel-set medals.

On February 15th, 1905, Captain Baldwin with his Airship, the "California Arrow," raced the fastest automobile on the Pacific Coast, a Pope Toledo. The race was from the Chutes Park, Los Angeles, to the Raymond Hotel, Pasadena (10 miles). The aeronaut of the airship landed on the grounds of the hotel two minutes before the speedy automobile reached the hotel. The Los Angeles "Examiner" of February 15th, 1905, said: "In a race with an automobile, the fastest vehicle man has yet been able to invent, Captain Baldwin's Airship, the "California Arrow," won. The outcome of the contest is considered the most striking demonstration of the possibility of aerial navigation that has been made in any part of the world." Then Captain Baldwin sailed back to Los Angeles.

Captain Baldwin after leaving Quincy set out on an eastern tour, and was advertised for a certain day in Chicago, but so hazardous did the people consider the feat that they passed an ordinance prohibiting a man to jump from a balloon with a parachute. The same ordinance was passed in New York, and it afterwards became a state law, and is still in existence, though not enforced.

While giving exhibitions at Rockaway Beach, he would go up, out over the ocean and down into it. Well they could ask:

What were the wild waves saying,
　　Baldwin, that Autumn day
When up through the mid air swaying
　　You drifted and drifted away;
While thousands were breathlessly praying,
　　And watching with dire dismay,
A white spot that hung delaying
　　In the ether, miles away?

What were the grand thoughts thrilling
　　Your soul on that Autumn day,
When like an immortal fulfilling
　　Some behest, you soared away,
With the ambient air distilling,
　　Elixers, whose force you obey,
While the parachute slowly filling
　　Wafted you miles away.

From America Captain Baldwin went to Europe, and this is what was said of him there: (From a London paper.) "One of the greatest sensations ever offered to the British public was successfully performed on Saturday last, July 29th, 1888, at the Alexandria Palace, by Thomas Scott Baldwin, jumping from a balloon at a thousand feet by aid of a parachute."

Here is an official statement, London, England, July 30th, 1888:

"I am of the opinion that Thomas Scott Baldwin has made one of the greatest discoveries in the practical application of aeronautical science—I mean the practical application of science, so as to realize results, which previous to the invention of his parachute, seemed to be absolutely unattainable."

WM. H. LE FEVRE, C. E.,
President, Balloon Society of Great Britain.

After Captain Baldwin's tenth jump from Alexandria Palace, where the nobility, people of renown, members of the Balloon Society of Great Britain and others were gathered, Mr. Le Fevre, President of the Balloon Society of Great Britain, presented Captain Baldwin with the first gold medal which had ever been awarded by that Society.

One afternoon the Prince and Princess of Wales, their three daughters, and many prominent and distinguished persons gathered at the Palace to witness a jump, and so well pleased were they that the Prince of Wales presented Captain Baldwin with a huge diamond set in a ring, commending him upon his daring, bravery and his aid to science.

Captain Baldwin has traveled around the world twice, giving exhibitions before the nobility and crowned heads in all the prominent cities of Australia, China, Japan, Egypt, and in fact every country.

Captain Baldwin has gone from one aeronautical venture to another, has handled all kinds of balloons, and run his captive balloons at the various expositions, carrying thousands and thousands of people up into the air.

During the San Francisco disaster Captain Baldwin lost the largest and most perfectly equipped aerostat in the world, which was the culmination of twenty years of scientific experiments, aided by accumulated knowledge gleaned from every quarter of the globe. The following is a bit of data about it: diameter, 65 ft.; circumference, 204 ft.; height over all, 105 ft.; gas capacity, 140,000 cubic ft.; lifting power, 9,100 pounds; carrying capacity, 18 persons; pongee silk used in construction, 8,640 yards; number of panels, which were double, 2,816; rope used in making net, 5 miles; weight of gas envelope, 2,000 pounds; weight of net and ropes, 2,200 pounds; weight of cable, 500 pounds; length of cable, 1,500 ft.; breaking strain tested, 22,000 pounds; combined breaking strain of net, 100,000 pounds; double reversible engine, 40 horsepower; amount of iron used in original charge, 20 tons; time required for original charge, 5 days.

This monster balloon was run captive in Los Angeles and San Francisco. Captain Baldwin took it to Denver, where he started on a long balloon voyage, but was caught in a storm, and battered and banged around Pike's Peak, up and down the canyons, buffeted here and there, with the huge gas bag covered with ice, until there seemed no possible chance for safety. This is the highest and rockiest portion of the entire Rocky Mountain Range. On this occasion he hung for 14 hours around and above the top of Pike's Peak, and all the time above 14,000 feet. He had two gentlemen with him, and Captain Baldwin believes this was the most dangerous balloon trip that has gone on record. One minute there would be a chance, the next they were again helpless.

Many years ago Captain Baldwin made an airship run by foot power, and realizing the fact that it would never work, abandoned it and spent years in trying to find a suitable motor. The next airship he built was 105 feet long, and he had to buy an automobile to get an engine, but the engine was so heavy, the envelope had to be enlarged, and again realizing he must hunt further for a motor, abandoned this airship.

One day hearing of a good motorcycle in Hammondsport, N. Y., Captain Baldwin wrote and had a motor made from his own design, and the G. H. Curtiss airship motor is the best on the market today. In the meantime work was begun on a small airship 17 x 52 feet, and just six weeks after the silk was cut, August 3d, 1904, Captain Baldwin in his "California Arrow" made the first successful airship flight that had ever been made in America.

He immediately took his airship to the St. Louis Exposition, and saved the day for the Exposition, as they had advertised their aeronautic concession as their strong point, and had offered a $100,000 prize, but up until October not a flight had been attempted, and not an airship dared cut loose. The "California Arrow" made six return flights there.

The first "California Arrow" was indeed a crude affair to what it is to-day, though she is still the "California Arrow," but improved with age.

Captain Baldwin took his airship to the Portland Exposition, and it has been all over California, Nova Scotia, and the Eastern States, where he has met only with success. By the way, "success" is his motto and he has never known a failure.

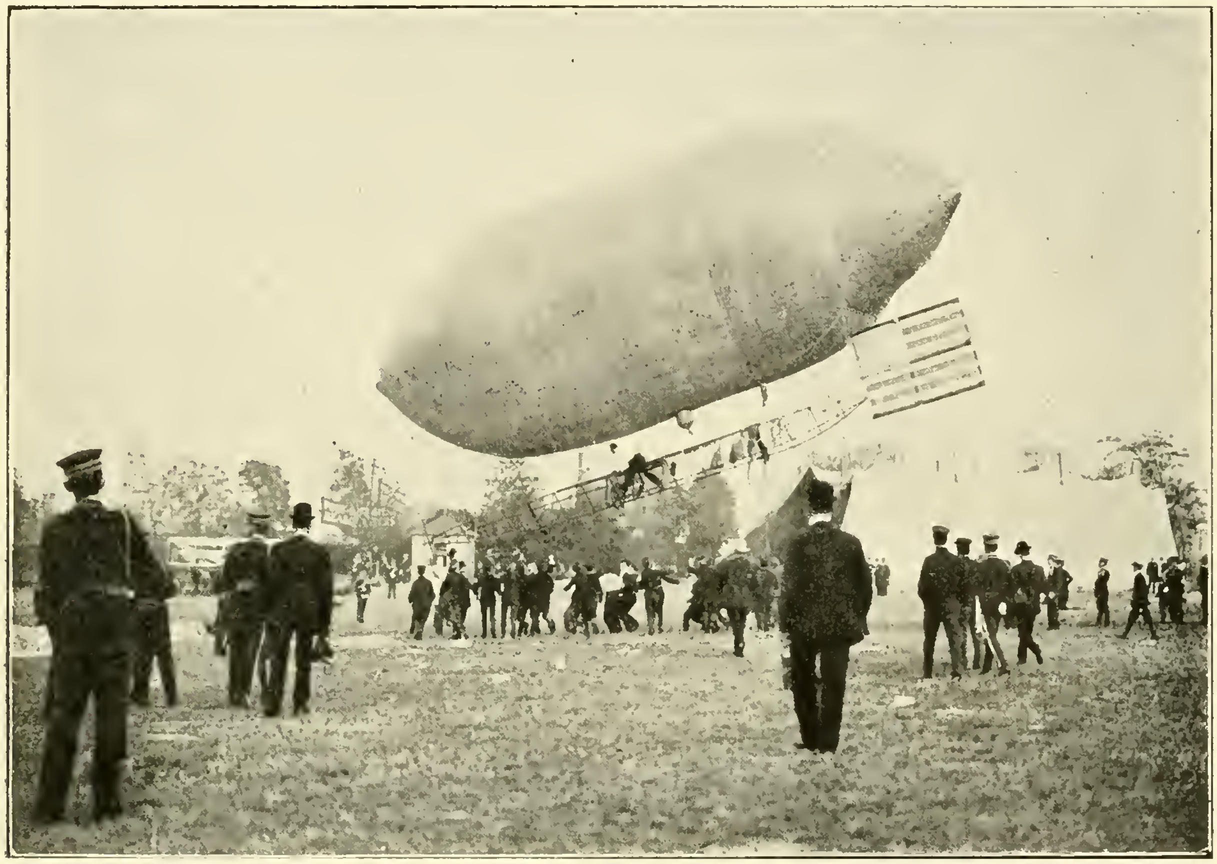
During the San Francisco fire he lost all his aeronautical outfit, and had to construct everything new. This enabled him to try many new experiments. What Captain Baldwin wants is a perfect model that can be enlarged to any size, as he dreams

of a day when the air currents will be mapped out as are the currents of the water, and when aerial navigation will be a means of transportation.

What he knows he is anxious to tell, as he knows by so doing he will aid others, and will lose nothing, as he has no secrets. The airship to him is an accomplished thing, and has now long ago passed the experimental age so far as he is concerned, and there only remains the working out of each principle in detail.

He believes the gas bag will never be done away with, but that the aeroplane and gas bag will be combined to form the heavy airship that is to come.

The leading difficulty so far in airship building is to combine the minimum of weight with the maximum of strength, and at the same time have a powerful enough motor to prevent the gas bag from being swayed and buffeted in the various currents.



BALDWIN'S "CALIFORNIA ARROW" AT ST. LOUIS, OCT., 1907.

Captain Baldwin is the pioneer of airship fame, and he had no drawings and set rules to experiment with, but has worked out each point to his own satisfaction; and that coupled with his thirty years of aeronautical knowledge and experience, and over three thousand ascensions, has enabled him to overcome the major portion of the difficulties.

There is not an airship in America to-day that can make a successful flight that has varied one iota from the principles he first employed in his "California Arrow," and there is not a successful pilot that has not had his first experience in a "California Arrow" and had his schooling under Captain Baldwin. He takes the lead and they all follow as close as possible in his path.

To date the record of the "California Arrow" stands: 1904, sixteen flights, returning to the starting point nine times; 1905, twenty-five flights, twenty-three returns; 1906, fifty-three flights, fifty-one returns; in 1907 the airship made ninety-two flights, returning to the starting point niney-one times.

During the races in St. Louis, October 22d, 1907, Captain Baldwin entered two airships: one a speedy double propeller airship for the race, the other his exhibition machine with which he had made some eighty odd flights during the summer. On Tuesday he gave two exhibitions for the benefit of the large crowds that were congregated on the grounds. His two-propeller machine that he expected to enter in the race had been shipped to St. Louis to him, but when setting up the eight-cylinder engine, through some error, which made it necessary to sit on the rudder to get the proper balance, the machine could not be used, so there was nothing left for him but to do the best he could with the exhibition machine, and this is what he succeeded in doing.

There were five airships entered at the races, and they made thirteen starts. Of these, five of the airships did not get back to the concourse under their own power, and there were eight return flights made, of which he in his "California Arrow" made five. In other words, the "California Arrow" made nearly twice as many flights as all the others put together.

Captain Baldwin is not like other airship men and manufacturers that seem to stand still; but he is ever on the alert, and seldom goes in the air that he does not see where some improvement can be made, and he immediately makes it.

In June, 1907, Captain Baldwin brought out a new double forward propeller, turning in opposite directions on the same shaft, which heretofore had been contrary to all scientific principles, which he has proven to be the missing link in handling an airship, and which entirely does away with the torque.

Each year before he opens his season he must have a complete new outfit—even his aerodrome must be new, and I might mention that this year he has an entirely new construction for his aerodrome. It is a large tent, 50 by 100 feet, but has not a rope on it, but is webbed in place of roped, which adds materially to the strength and appearance of same, and I dare say this is the first tent ever made after this method.

Captain Baldwin has never met with an accident, and had never so much as received a scratch, and has never allowed one of his assistants or pupils to receive a scratch. This carefulness on his part has saved a host of lives, and that is why he has thrown away many better balloons than the average professional uses, because of small defects, and why he is alive and in robust health, and has produced a successful airship.

The early part of January the War Department issued specifications for a dirigible balloon, which was to be made of a foreign material. The Government was to furnish the material, and the American to make the airship. Captain Baldwin did not put in a bid on these first specifications, none were accepted, and new specifications were sent out calling for the bidder to furnish his own material with a minimum breaking strain of not less than 62½ pounds per inch width, and must require no varnish. Captain Baldwin put in a bid on this second specification submitting samples of his vulcanized proof material. The contract was awarded him, and he expects to be able to deliver the airship in a few weeks, as it is nearly ready for the finishing touches. The War Department thought so highly of this material that they have just issued bids for two spherical balloons to be made of fabric of American manufacture, made by rolling together two layers of silk having rubber between. The contract was awarded to Captain Baldwin and is for one 540-cubic-meter balloon, and one 1,000-cubic-meter balloon to be made of his vulcanized proof material.

Rubber proof material first originated in Germany, and it was several years before France adopted it, but it is rapidly coming to the front, and the day is not far distant, so Captain Baldwin says, when manufacturers and balloonists will have to get away from varnished material, because varnished material has not enough elasticity, and in order to be gas tight they must be revarnished from time to time, and this adds weight, as each coat weighs considerable. The chemical action of oxygen on varnished material is such that in time it becomes useless. Linseed oil varnish only drys by absorbing oxygen from the air, therefore it is constantly undergoing a change. The first cost of a varnished balloon is not the end of the expense, as after each flight it must be revarnished, and after each coat is rendered more fragile, and is subject to spontaneous combustion, which is the plague spot in varnished material. The life of a varnished balloon is about one-fifth that of a proof material balloon.

The reason why Captain Baldwin's vulcanized proof material has come to stay is that it has the following merits: the weight of the vulcanized proof material is always the same, as it does not require further treatment; heat and cold have no effect on it, and ascensions can be made just as well at zero weather as in the summer time. The chemical action of oxygen on the vulcanized proof material has not the same detrimental effect as it has on the varnished material. The vulcanized proof material, double wall silk, has ten times the strength of varnished material, and is more economical in weight than a varnished balloon. A man can take care of his own vulcanized proof balloon, as it needs little or no care, and is not subject to spontaneous combustion. He cannot do this with a varnished balloon. A vulcanized proof balloon is cheaper in the end, as it does not have to spend half its time in the repair shop, and will last from five to six times as long as a varnished balloon. The day is surely coming when, if a man wants an absolute gas holder, he must use the proof material.

The strength of Captain Baldwin's vulcanized proof material, according to weight of material used, will stand from 60 to 100 pounds pressure per inch width.

One great fault with the manufacturers of balloons in this country is that they will use the same weight material for a 20,000-cubic-foot balloon that they will for a 60,000-cubic-foot balloon. This is another thing that is rapidly nearing correction. In Germany and foreign countries it is against the law for a balloon to go into the air

that has not been thoroughly tested and inspected by an expert. Would you think of putting an unsafe vessel on the water in the hands of a man that did not understand how to handle it, but only through seeing the success of some one handling it, thought he could do the same? What would the result be? Just what it is with these inexperienced men that call themselves aeronauts, and have never been in the air.

There should surely be some limit placed on these reckless men and boys, that not only endanger their own lives, but those of others. I guess Mr. Albert C. Triaca, who has just opened an aeronautical school, realized this fact better than any one, knows the weight and strength of materials, and sees the day not far off when these foolish disasters must come to a stop, and all balloons be inspected. If they cannot undergo the inspection then they cannot go in the air. Mr. Triaca said the other evening at the Aero Club that he considered the San Francisco accident criminal, and these things should come to a stop.

Among all the balloons entered at the St. Louis races there was one Pilot, Herr Erbsloh, with the German balloon, that dared tie up the neck of his balloon before the start, and allow it to expand through the elasticity of the material, which was proof material, and the fact of his being able to do this and save his gas probably won the race for him.

I am sure that all that are interested in the Government airship will look forward to the first flight, which is going to take place shortly, and wish Captain Baldwin success.

NOTES

Six numbers have now appeared of our British contemporary, "Aeronautics," and a fine journal it is. It was started in December, 1907, with Major Baden-Powell and John H. Ledeboer editors, as a supplement to "Knowledge and Illustrated Scientific News," but so great was the demand that, beginning with the March number, it has been issued as a separate magazine. It being the only monthly journal published in English in Great Britain it is a welcome companion to the other magazine in English, the American Aeronautics. May its shadow never grow less!

H. K. Hitchcock, of Montreal, has just returned from a short trip to England and Europe and writes of his findings as follows:

"I had a nice trip from London to Brighton in a 77,500 balloon, a party of eight of us, no particular features in the trip. Distance about 45 miles in 1 hour 5 minutes, using ripping cord on descent on account of the wind. Made height of about 6,000 feet.

"I had a talk with one of the Balloon corps, Aldershot, men. The new motor for the second dirigible is of 50 horse-power, air cooled, weight about 150 pounds, and is being tested and built by Panhard's in their London shops.

"Spencer is building a helicopter for an inventor—particulars are a secret at present.

"Clement, in Paris, is at work on models of a combined dirigible and aeroplane, shaped just like an oyster, with the motor slung below the thickest part. It certainly glides well and also has a natural parachute action in case of a direct vertical drop.

"Clement is also working up a reversible propeller for airships, etc., on motor boat lines, for varying angle and reversing if necessary.

"Mallet's shop is very busy on ordinary balloons, as also is Spencer in London.

"Spencer has just completed a new 12 horse-power, 3 cylinder, Buchet, air cooled, dirigible for show purposes this Summer, using coal gas; bamboo frame, side suspension envelope, but no really new features.

"How about Montreal as a starting point? We get lots of stray northwest winds and the gas is good and light for ballooning—cost $1 a thousand."

S. Y. Beach, of the Scientific American, and Gustave Whitehead, took out in March English patent 5312 for "improvements in aeroplanes."

A. Leo Stevens has gone to Salem, Ohio, to make an ascension or two with Dr. H. W. Thompson and Mrs. Thompson.

Mayor Sherburn M. Becker, of Milwaukee, has been in New York and visited the Stevens workshop. Within a short time Mr. Stevens will go to Milwaukee to pilot the Mayor on several trips. It is expected to make stops along the line of the various trips.

The two old balloons which the Count de la Vaulx saddled upon the Aero Club of America have at last been disposed of. The "Centaur," of 1,200 cubic meters, has been purchased by Capt. Thos. S. Baldwin, and the "Orient," of 1,000 cubic meters, has been sold through Leo Stevens to W. H. Anderson, of Philadelphia, who will use it in connection with fireworks. Still going up!

The Pittsfield club has purchased a new balloon from Leo Stevens of 35,000 cubic feet, to be called "The Heart of the Berkshires."

THE ADAMS-FARWELL AERO MOTOR.

A gasoline motor of exceedingly light weight per horse power developed has been brought out by The Adams Company, of Dubuque, Iowa.

The motor is the design of F. O. Farwell, patentee of the revolving cylinder motor used in the Adams-Farwell motor car, and while it is built on the same general lines as the automobile motor, by refinement it becomes an interesting example of light weight.

The two motors shown were built for a prominent eastern inventor to be used for aeronautic experiments. For this purpose this motor possesses many interesting peculiarities. The motor has five cylinders, 4¼-inch bore, 3½-inch stroke, and is run at a speed up to 1,800 r. p. m.

The motor complete in operative condition with timer, float feed carburetor, automatic force feed oil pump and oil tank, weighs 97¼ lb. With the spider shown in the photographs, which, in this case, secures the motor to four tubes, the motor and base and all weigh 104 lb. By the A. L. A. M. rule this motor is rated 36 h. p.

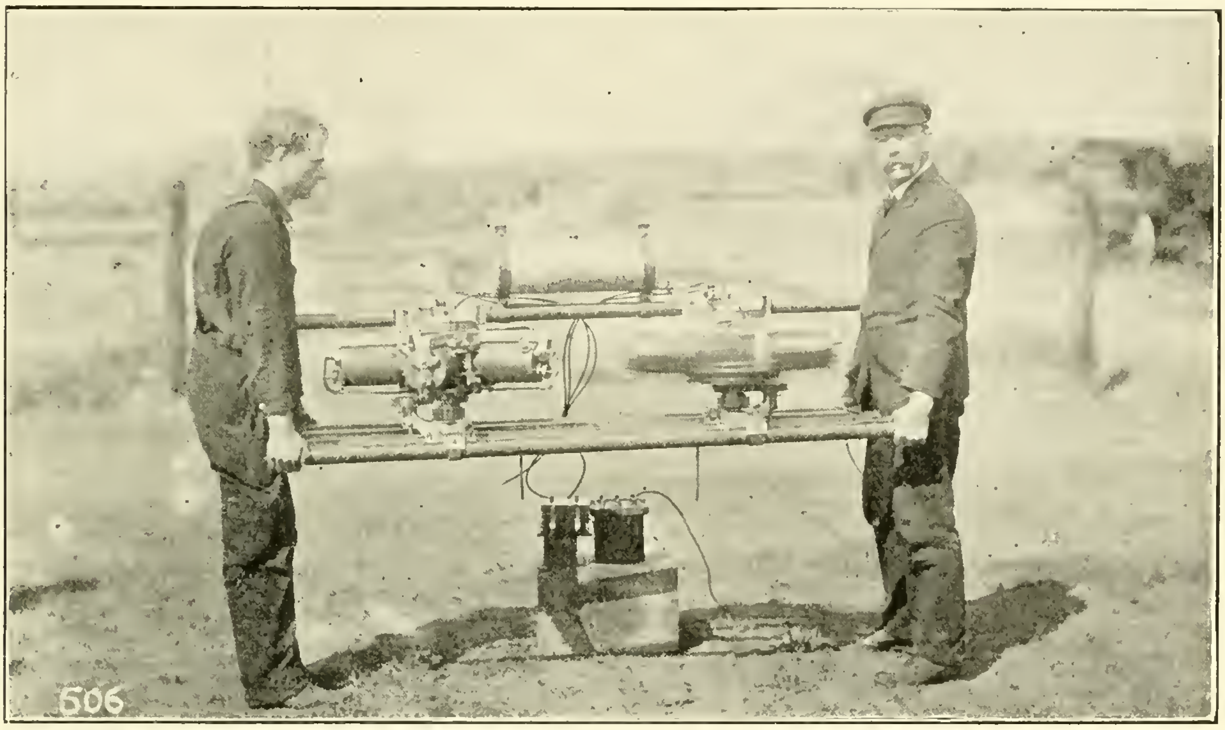


Photo No. 506 shows two of these 36-h. p. motors held in the hands of two men, while one of the motors is running at full speed. The absence of vibration is shown by the clearness of the photograph of the parts not in motion.

Its weight per horsepower developed is believed to be the lightest of any motor not sacrificing strength and durability to weight. In comparing weights it is well to take into consideration the fact that the weight of the water, radiator, piping and fan used in water-cooled motors are not often given with the weight of the motor. The light weight of this motor, which is air cooled, is brought about more by the simplicity of its construction and the high grade of the material used than by reduction of strength to the minimum.

The makers say they have every reason to believe that these motors will stand as hard and continuous use as their regular automobile motors, some of which have been in use for eight years and are in fine running condition to-day.

The Adams-Farwell motor is not what is usually termed a rotary engine. The cylinders revolve around a common center—the vertical stationary crank shaft. The pistons and connecting rods revolve around another common center—the single crank pin. At one point the pistons reach the head of the cylinder; at another point the pistons approach the base of the cylinder, but no moving part ever comes to a stop while the engine is running. It spins like a top.

Each cylinder is complete with head and part of the central crank case cast in one piece of steel of high tensile strength and they weigh only 7½ lb. each.

Five of these cylinders are bolted together and bolted to a top aluminum flange (which also forms the gas manifold), weighing 3 lb., and to a bottom steel flange which also supports the valve cam and transmission gear. These flanges have long bronze bushes and form bearings around the vertical stationary crank shaft.

In each cylinder is a cast iron piston weighing 2½ lb. All the pistons are connected to a single crank pin by bronze connecting rods, which interlock each other around a bronze lined steel bush about the crank pin.

The cylinders revolve as one piece in perfect mechanical balance around one center. The pistons swing around another common center. It is a continuous circular motion and there is no shock, vibration or loss of power in overcoming the inertia of reciprocating parts as in other motors.

By revolving the cylinders instead of the crank shaft very desirable features for aeronautic, speed boat and automobile motors are secured.

The feature of cooling is perhaps among the most important. Without one ounce of cooling device the makers claim the best cooled of all gasoline motors. The cylinders move rapidly through the air like the arms of a centrifugal blower. Centrifugal force removes the air in contact with the cylinders, and atmospheric pressure supplies fresh air. The circulation of air is equally rapid on all sides of all cylinders and as the cylinders are of equal thickness on all sides the expansion is equal and the cylinders may be made light without fear of distortion. The result is entirely different from blowing air upon one side of a cylinder or row of cylinders.

Those who are not familiar with the results obtained by the use of the Adams-Farwell cooling system may question the advisability of making these cylinders smooth and without radiating flanges.

The Adams-Farwell automobile motors have always had longitudinal flanges cast with the cylinders. During the summer of 1907 a seven-passenger automobile was provided with a motor of 5-inch bore and 5-inch stroke, with five smooth cylinders. This machine was used to test the cooling quality of the flangeless cylinders. It seemed to cool perfectly under the most severe conditions, such as climbing long, steep hills and long runs in deep sand. As these 5-inch bore cylinders without flanges showed such good results it was deemed unnecessary to provide the 4¼-inch bore cylinders with flanges. The tests made have proven that the flanges are unnecessary. It is the enormous volume of air that does the business.

Water-cooling systems are a great handicap, especially on aeronautic motors. "Motor Print" of May, 1908, in speaking of the flying machines of Henry Farman and Leon Delagrange, says:

"The motors on both machines are of the water-cooled type, and this has been a constant source of inconvenience. In fact, the only thing that has limited the flight thus far apparently has been the necessity to stop for water."

While not an ounce of weight is added for balance or fly wheel, the revolving element that is utilized for balance wheel is over 80 per cent. of the entire weight or mass of the motor.

This heavy fly-wheel revolving rapidly around a vertical axis exerts an enormous gyroscopic force to keep the motor and that to which it is attached in a true plane. The motor spins like a top, and like a top it has a tendency to resist being tipped over while spinning. It also has a tendency to quickly right itself if forcibly thrown out of its proper running plane. This force can be utilized to maintain equilibrium in a flying machine. Gyroscopic force is the only known means of obtaining a leverage without the use of a fulcrum based upon the earth.

The heavy fly-wheel is also conducive to very steady running, and transmits a constant torque to the propeller. A gasoline motor, particularly one using high compression, transmits its power by a series of violent explosions or blows, and even though several cylinders may be used to divide up this series of blows, the arms of the propeller or fan used to propel a flying machine are subjected to destructive strains unless a fly-wheel of sufficient weight is interposed between the motor and propeller to absorb and distribute this series of blows.

A heavy fly-wheel also permits of the use of high compression which is more economical and produces more power from the same cylinder sizes than the low compression usually used in automobile and aeronautic motors.

This heavy fly-wheel, together with the variable compression system used for controlling the motor speed and power, permits of a very wide range of speeds underload.

The variable compression system referred to has been used for several years on the Adams-Farwell automobile motors, and consists in mechanically holding the inlet valve open for a part of the compression stroke and closing it after a part of the gas has been blown back and taken in by another cylinder which is at the time on the suction stroke.

The compression is relieved and the motor is easily turned when it starts and runs slowly. The compression may be gradually increased until maximum speed and power is obtained, and it may be as gradually reduced when stopping the motor. There is not that abruptness in starting or stopping which characterizes the ordinary gasoline motor, and the propeller arms are thus relieved of much strain.

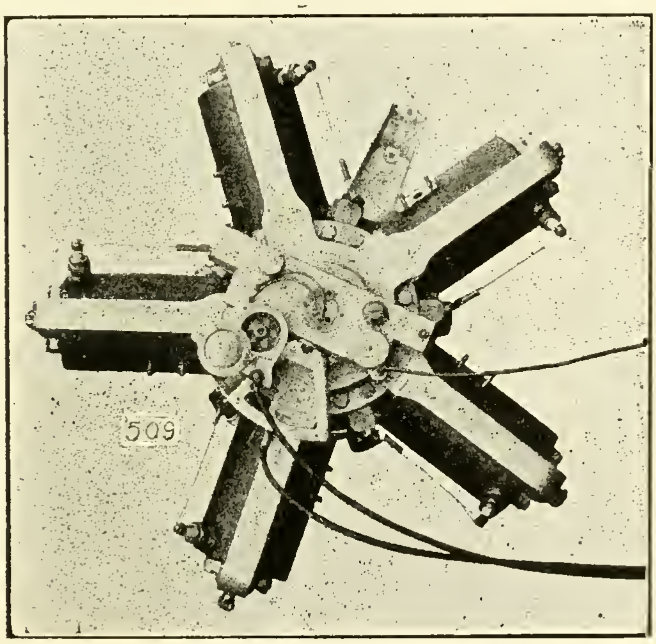
After the motor is started the spark lever is set and requires no further attention. All speeds are obtained by the variable compression lever. The proper firing is cared for automatically.

The simplicity of this motor and the reason why it can be made so light without sacrificing strength will be better realized when it is understood that, in addition to saving fly-wheel and cooling system weight and complication, the following essential elements are greatly simplified:

The crank shaft in this 5-cylinder motor is just like the crank for a 1-cylinder motor. It is a short single-throw crank, and, although the bearings are large and long, 1⅜ in. x 2¼ in., 1⅜ in. x 4 in. and 1⅜ in. x 3⅝ in., the shaft only weighs 4½ lb.

All the valves, ten in number, are operated by one cam. The valves have no springs to close them; but being in the head of the cylinders, and closing outwardly, they are closed by centrifugal force. The higher the speed of the motor the greater this force and the greater the necessity for a stiff spring or force to close the valves quickly.

The wiring for the ignition system of this 5-cylinder motor is just as simple as it could be for a single cylinder motor. There is but one spark coil, one timer contact, one primary and one secondary wire. Photo No. 509, showing the top view of the motor, will enable us to explain the ignition system. The primary wire is attached to a flat steel spring which is insulated from the remainder of the timer by a fiber block not shown. A hardened steel wheel is free on an eccentric or cranked end of a short shaft which is geared to the motor and makes one revolution to each two-fifths of a revolution of the motor.



A distributor for the secondary current is formed by a strip of brass on the lower edge of a segment of fibre supported by a bracket as shown by the photos.

A short bare wire leads from the spark plug on each cylinder to a fibre insulator near the crank case. In the top of this insulator is a screw, which, when the motor turns, passes under the distributor, but does not touch. When the cylinder which is to be fired passes under the distributor, the timer wheel makes contact with the spring, and the secondary current passes to the spark plug of that cylinder. Each alternate cylinder is on the power stroke as it passes the dead center of the crank. There being five cylinders, the power strokes are in perfect rhythm. After the motor is started the timer case is swung around to the left, which advances the spark to its maximum. No further attention is required. The variable compression takes care of the proper firing.

The same shaft that turns the timer wheel revolves by worm gear the force feed oil pump. This is a very simple and positive device having four little cam-actuated plungers, each of which pumps a drop of oil at each revolution of the pump barrel.

The rectangular block shown at the top, which is clamped to the upper tube, not only forms a support to the upper end of the crank shaft, but forms an oil tank for ½ pint of lubricating oil, supports the timer and oil pump, and in the right end is formed the carburetor with float feed chamber, and it supports the distributor. This complete device weighs only 2½ lb.

The two motors shown in the photograph are now being used by a well-known inventor, who is making secret tests of a new type of aeroplane.

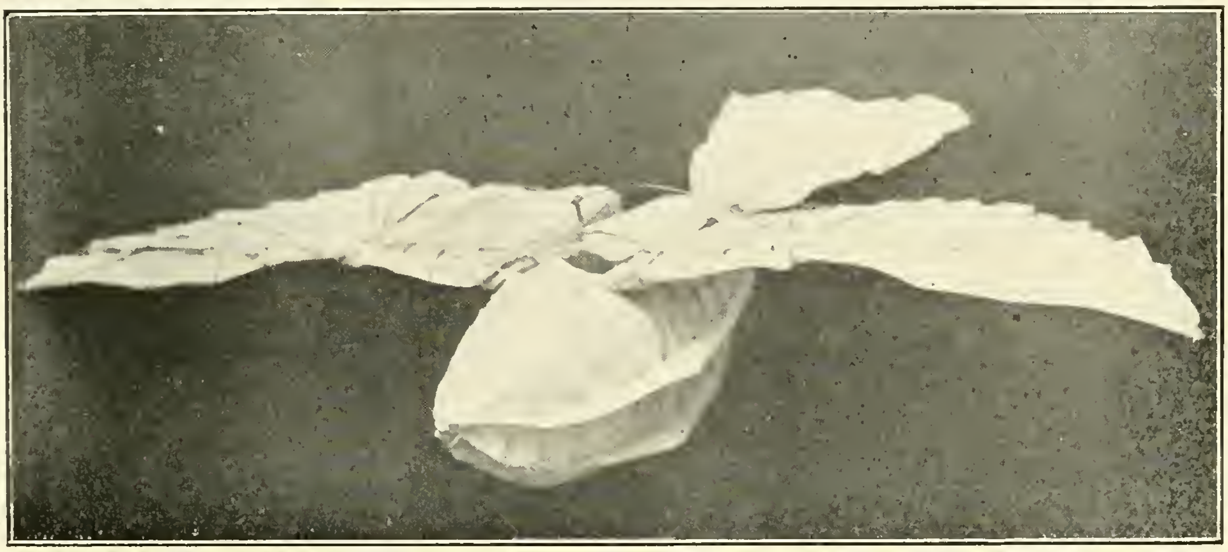
If these tests result as favorably as might be expected, in consideration of the remarkable advantages possessed by the motors we may see a practical "heavier-than-air" flying machine this summer.

A few of the innovations introduced by Farwell's new aeronautic motor:

Gyroscopic force utilized to steady airships in their flight; the entire motor revolves around a stationary crank shaft; the lightest motor of its power that has ever been constructed, 97¼ lb., rated at 36 h. p.; motor has no fly-wheel, no muffler and no cooling device; valves are closed by centrifugal force instead of by springs; ten valves are actuated by a single cam; a single-throw crank shaft weighing only 4½ lb. is used in a 5-cylinder, 36-h. p. motor; ignition system is identically the same as used on single-cylinder motors of ordinary design; no reciprocating parts; controlled like a Corliss Steam Engine; centrifugal force puts the gas into the cylinder under pressure.

NOTES.

An airship, shaped like a bird, which has been under construction for several months by the Bayonne Aerial Navigation Company, is nearing completion, and its inventor, Julius Uherkovich de Uherkocz, an Austrian nobleman, said yesterday, as he exhibited a model of the ship, that he feels assured the ship will meet all expectations and will solve aerial navigation. He is planning to test the machine in Bayonne as soon as it is completed. The ship is now being put together in a large building adjoining the Bayonne Opera House, and the work is being done secretly.



This ship is shaped as nearly like a bird as possible and from end to end will measure 27 feet. It will be 12 feet in width. The tail will measure 14 feet and will be used as a steering apparatus, being operated by ball-bearing machinery. Immense wings are attached to both sides of the ship. They will extend 27 feet out from the body and will have a spread of 54 feet.

Motive power will be furnished by a 60-h. p. gasolene engine, which is being made in France and which will weigh 128 pounds. The ship will carry three persons and will be operated from within the body.

The inventor believes he will be able to send the ship along at from 60 to 100 miles an hour. The outside of the ship will be of silk, and the wings and tail will be of silk woven on bamboo. The wings and tail may be set at any angle.

Aeronautics have assumed quite a commercial position with Carl E. Myers during his 30 years' continuous exploits, both as a pioneer and veteran. He regularly manufactures a complete captive balloon outfit, consisting of balloon with car for three to four persons, with cable, windlass, motor and hydrogen gas plant, selling for $1,200, with full instructions for operating anywhere. He also builds a regular size one-man airship, with 7-h. p. motor and gas plant, for $1,300, with instructions for operating anywhere. This full-size airship condenses into a bulk of 2x3 feet for transportation by express, together with the telescoped frame 2x9 ft., weighing 36 lbs. This equipment is the lightest yet produced, efficient and reliable, and is the result of 30 years' constant, successful experience, and is fully covered by patents.

The services of either Mr. Myers himself, or of competent operatives having years of experience with him, can be procured at moderate expense for operation with free balloons, captive balloons, or motor airships, without risk of failure involved with unreliable apparatus and inexperienced beginners, experimenting at the risk and expense of the public, or credulous employers.

The new dirigible of Zeppelin, the No. 4, cost $100,000. It is 7 meters longer than the previous model, that is, 128 meters long and 11.07 meters diameter. It is propelled by 3 motors of 140 h. p. each, and great speed is expected. The total weight of the propulsive apparatus is 2 kilograms less per horsepower than the previous one. It is expected also to be capable of covering a radius of 2,300 kilometers, that is, capable of going from Lake Constance to Koenigsberg and return, equal to a trip across Germany at its greatest length and return—more than the trip from Paris to Casablanca, in Italy, not far from Rome.—L'Automobile.

MAY ASCENSIONS.

Note: Several records made during April are given because the reports have just been received from abroad. This magazine publishes a record of every flight made by any American aero club member anywhere in the world. The name first given is the pilot.

April 3—Ernest Barbotte and Albert Lambert (Aero Club of St. Louis) in the "Aurore 3," 900 cubic meters, from St. Cloud, France, at 11:15 A. M., landing at 2:15 P. M., at Esternay, France. Duration, 3 hours. Distance, 63.37 miles.

April 4—Frank S. Lahm (Aero Club of America), and Albert B. Lambert (A. C. of St. Louis), in Mr. Lahm's balloon, Katherine Hamilton, of 800 cubic meters, from St. Cloud, at 1:30 P. M., landing at Gretz. Duration, 50 minutes. Distance, 26.09 miles.

April 12—E. W. Mix and A. B. Lambert (A. C. of St. Louis) in the "Albatross," of 800 cubic meters, from St. Cloud, at 1:10 P. M., landing at St. Cheron. Duration, 2 hours 40 minutes. Distance, 22.37 miles.

April 14—A. B. Lambert (A. C., St. Louis), alone in the "Eole 2," of 600 cubic meters, from St. Cloud, at 10:30 A. M., landing at Limours. Duration, 1 hour 30 minutes. Distance, 16.77 miles.

April 16—A. B. Lambert (A. C. of St. Louis), in the "Eole 2," of 600 cubic meters, from St. Cloud, at 11:45 A. M., landing at Trappes. Duration, 1 hour 30 minutes. Distance, 11.18 miles.

May 5—A. Holland Forbes, W. F. Whitehouse, A. Leo Stevens (Aero Club of America) and Henry Whitehouse, in the "Conquerer," of 2,250 cubic meters capacity, from North Adams at 10:50 A. M., landing 4 miles from Canton, Conn., at 4:25 P. M. The general direction was south. "Sun playing hide and seek." Distance, 62 miles. Elapsed time, 5 hours, 35 minutes. Average speed, 11.1 miles per hour. This was the first trip of the Conqueror, the new balloon of Mr. Forbes built by Leo Stevens. About six thousand people viewed the start. Mr. Forbes has expressed the utmost satisfaction at the hydrogen-tightness of the new balloon and the extraordinarily light gas furnished by the North Adams plant.

THE CONQUEROR.

Wm. F. Whitehouse, Henry Whitehouse, Leo Stevens and A. Holland Forbes.

In the making of the balloon 1700 yards of percale were used, coated with 6 layers of varnish. When inflated it stands 95 feet high. In the first flight, besides two passengers, 60 bags of ballast were carried averaging 40 pounds apiece.

May 10—J. C. McCoy, Charles J. Glidden (both Aero Club of America) and Melvin Vaniman, the engineer of the Wellman airship which did not fly to the pole, in the "Aero Club III.," 1,200 cubic meters, from St. Cloud, France, at 3:15 P. M., landing at Vigneux at 5:34 P. M. Distance, 13.98 miles. Elapsed time, 2 hours 19 minutes. Average speed, 6.03 miles per hour. Direction, S. E. Altitude, 1,000 meters.

May 13—J. C. McCoy, Charles J. Glidden (Aero Club of America) and Melvin Vaniman, in the "Aero Club III.," 1,200 cubic meters, from St. Cloud, Paris, at 12:30 P. M., landing at Bruys 3:30 P. M. Distance, 74.56 miles. Elapsed time, 3 hours. Average speed, 24.85 miles per hour. Highest altitude, 8,856 feet. Direction, N. E.

May 13—Lieut. Frank P. Lahm (Aero Club of America), Major Edgar Russell

and Capt. Chas. S. Wallace, the Disbursing Officer of the Signal Corps, in the Signal Corps 10, from Washington, at 1:30 P. M., landing near Woodwardville P. O., Md., at 4:10 P. M. Distance, 20 miles. Elapsed time, 2 hours 40 minutes. General direction, N. E. Average speed, 7.5 miles. Experiments were made in receiving messages by wireless telegraph. Messages were sent at different times between 1:45 P. M. and 3:30 P. M. by the Washington Navy Yard and the Annapolis wireless stations. All messages were distinctly heard in the balloon. A small portable receiving set was carried in the balloon car, a 300-foot wire was suspended and a wire screen attached around the outside of the car. The trial was a complete success. The altitude varied between 300 and 4,200 feet, with no apparent effect on the receiving of the wireless-grams.

Miss Forbes: "Conqueror, I christen thee!"

May 13—J. C. McCoy, Chas. J. Glidden (both A. C. of America) and Melvin Vaniman, in the Aero Club 3, of 1,200 cubic meters from St. Cloud, at 12:30 P. M., landing at Bruys at 3:30. Duration, 3 hours. Distance, 74.56 miles. Direction, S. W. Highest altitude, 2,700 meters.

May 18—Griffith Brewer and Chas. J. Glidden (A. C. of America), in the Lotus, of 1,000 cubic meters from London (Battersea), at 5 P. M., landing at Chalk, Kent, at 7 P. M. Duration, 2 hours. Distance, 24.85 miles. Direction, E. Highest altitude, 1,650 meters.

May 19—Griffith Brewer and Chas. J. Glidden (A. C. of America), in the Satellite, of 28,000 cubic feet, from London, at 6:15 P. M., landing at Welling at 7:15 P. M. Duration, 1 hour. Distance, 13½ miles. Direction, E. Highest altitude, 3,200 feet.

May 20—Griffith Brewer and Chas. J. Glidden (A. C. A.), in the Lotus, of 1,000 cubic meters, from Bath, at 4:22 P. M., landing at Bragdon 8 P. M. Duration, 3 hours 38 minutes. Distance, 15 miles. Direction, N. E. Altitude, 700 meters.

May 22—Griffith Brewer and Chas. J. Glidden (A. C. A.), in the Lotus, of 1,000 cubic meters from Bath, at 4:55 A. M., landing at Brackley 6:55 A. M. Duration, 2 hours. Distance, 70 miles. Direction, S. W. Altitude, 1,300 cubic meters. This is Mr. Glidden's eighth ascension and makes his total aerial mileage 345 miles.

May 23—A. Holland Forbes (Aero Club of America), Lawrence Mott, Edward Langley and A. D. Potter (North Adams Aero Club), in the Conqueror, 2,250 cubic

meters, from North Adams, at 11:55 A. M., landing at East Andover, N. H., on the birthplace of Daniel Webster, at 5:15 P. M. Distance, 86 miles. Elapsed time, 5 hours 20 minutes. Average speed, 16.1 miles. General direction, N. E.

May 23—A. Leo Stevens (Aero Club of America), Mrs. E. C. Peebles and E. C. Peebles, superintendent of the gas works at North Adams, in the North Adams No. 1, 1,000 cubic meters capacity, from North Adams, at 2 P. M., landing at Wilmington, Vt., at 3:30 P. M. Distance, 35 miles. Elapsed time, 1 hour 30 minutes. Average speed, 23.3 miles. Highest altitude, 5,600 feet. General direction, N. E.

May 23—Samuel King, Henry S. Gratz, Dr. T. Chalmers Fulton, Arthur T. Atherholt (all of Aero Club of Philadelphia and Ben. Franklin Balloon Ass'n); Hugh L. Willoughby, Alan R. Hawley and C. B. Harmon (all of A. C. of America) in the Ben.

Washington from a Balloon at a height of 700 feet. Photograph taken by Major Russel.

Franklin from Point Breeze, Philadelphia. Descent was made near Belair, N. J., about 6 miles from Camden, where Messrs. Gratz, Willoughby and Hawley left the party. The remaining members of the party continued the trip. No ascension record blank has been received from the Philadelphia clubs.

May 26—Lieut. Frank P. Lahm (Aero Club of America), Capt. Chas. S. Wallace, S. C., Sergt. Ward (Balloon Det.) and Corp. Rosenberger (Balloon Det.) in the Signal Corps 10, from Washington, at 2:07 P. M., landing at Grange, Md., at 3:56 P. M. Distance, 38 miles. Elapsed time, 1 hour 49 minutes. Average speed, 21 miles. General direction, N. E. Highest altitude, 1,900 meters.

THE FIRST BALLOON TRIP MADE BY A WOMAN FROM NORTH ADAMS.

Mrs. Edwin C. Peebles.

My first balloon ascension was made in company with my husband and aeronaut Leo Stevens as pilot on the afternoon of May 23rd. The ascension was made in the "North Adams No. 1" from the grounds of the Aero Club at North Adams, Mass.

It was two o'clock when we left the ground, just two hours after the big "Conqueror" had departed. It was reported that we were to attempt to overtake the latter, but this was not true, as we were out merely for a short pleasure trip.

Our balloon rose so slowly that as Mr. Stevens dropped the 275-foot drag line, some fifty feet of it fell upon the ground. We took a northeasterly course and floated slowly over the city at a height of about twenty-six hundred feet.

I had prepared myself for any and all kinds of unusual sensations on my first flight, so was agreeably surprised to find that there were none whatever. I felt not the slightest fear at any time and had no hesitation, even at the first, in leaning over the car to watch the drag line. Neither was I troubled with a roaring in my ears which bothers a great many balloonists.

N. H. Arnold, Leo Stevens, E. C. Peebles, Mrs. Peebles, Dr. Forester.

The weather was anything but ideal for ballooning, being hazy and sultry with sudden bursts of sunshine, followed by cold currents of air which made it impossible to maintain an equilibrium for more than a few minutes at a time. While these conditions necessarily cut short our trip, they presented an excellent opportunity to note the effects of temperature upon a balloon, and to watch Mr. Stevens grudgingly dispense each ounce of sand was to learn something of the value of ballast in ballooning.

As we approached Hartwellville, Vermont, the sun came out and sent us up to a height of fifty-six hundred feet. This was the highest altitude reached on the trip. At that time we were above most of the clouds and soon passed into a thick white haze which shut off all sight of the earth. It was then intensely hot, like being in an "aerial Turkish bath," and Mr. Stevens hung a coat on the ropes to protect us from the sun.

In a few minutes we were clear of the haze and began to descend. We found a strong air current quite close to the ground and moved rapidly for some time, trailing our drag line over the tops of the trees.

While Vermont does not always furnish the best of landing places, its scenery is unsurpassed. The view from a balloon at an altitude of several thousand feet must be seen to be appreciated. To describe it is impossible.

We crossed several ranges of mountains and soon came in sight of Wilmington, Vt. Our ballast was now nearly gone and after climbing the range north of the town Mr. Stevens chose a landing protected from the wind by a hill. When the anchor was dropped it buried itself nearly out of sight in the soft ground.

The car settled to earth with a scarcely perceptible jar, Mr. Stevens pulled the rip cord and the envelope collapsed without moving the car an inch. Our easy landing was quite remarkable in view of the fact that it was made without an ounce of sand, and was a strong tribute to the skill of our pilot.

We had been in the air an hour and a half, travelled about thirty-five miles and landed three and a half miles from Wilmington.

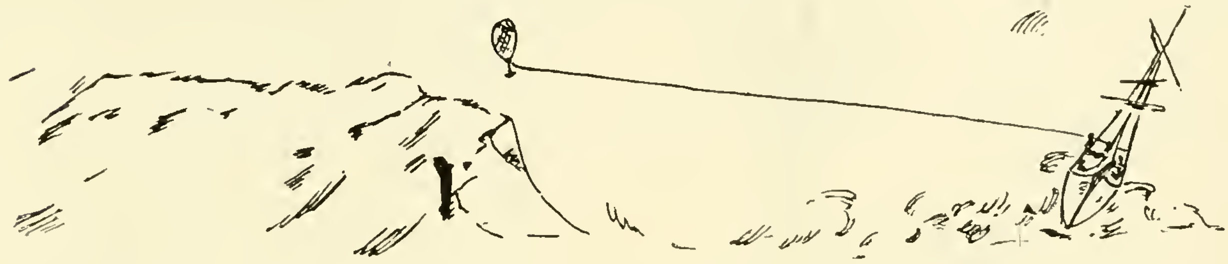
My experience has made me an ardent balloonist and both my husband and myself hope to make a long distance flight early in the Fall.

Another Aeronautic School.

A ballooning school has been established by Georges Gass. The first ascension was made from Colombes in the balloon "Bengali," of 630 cubic meters, M. Gass, the director of the school, acting as pilot.

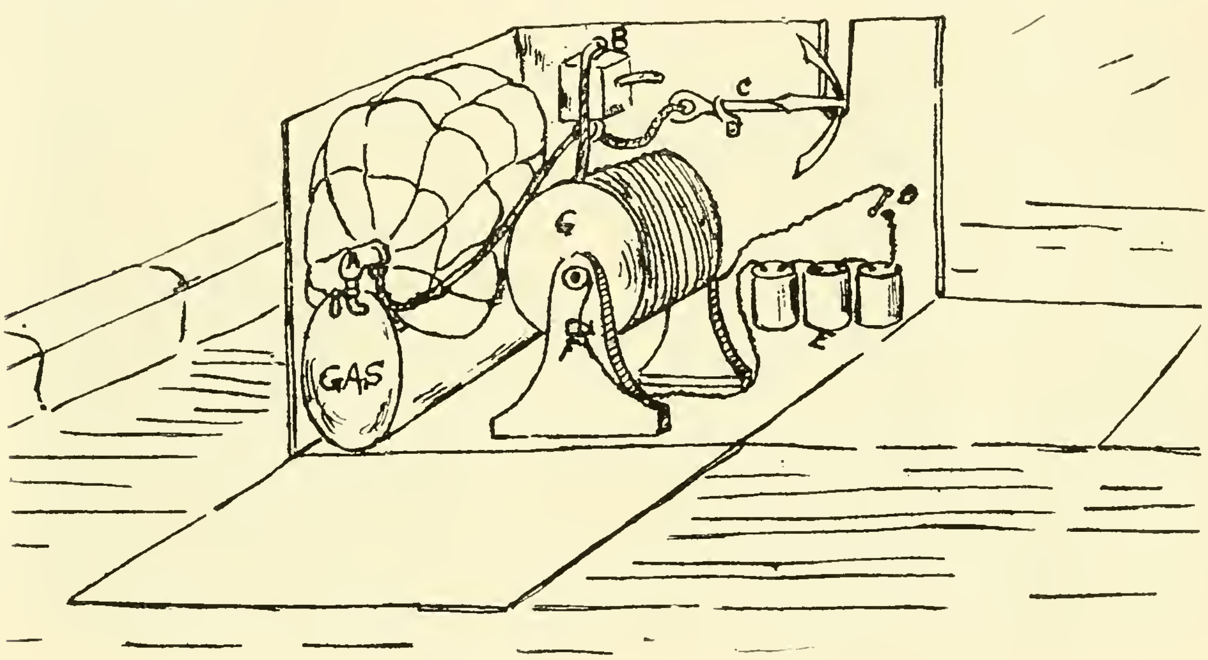
THE BALLOON AS AN AID TO A STRANDED SHIP.

Eberhardt P. Nicholson.



The sketch shows a stranded vessel connecting with the shore by the use of a balloon and an automatic device by which an anchor is dropped when the balloon is over shore. It may, of course, be said that the wind is not always inland, but that should be no reason for not having this apparatus aboard to be used when, in case of a wreck, the wind is inland.

The box containing the apparatus has hinged sides and a hinged lid, so that it can be opened as shown in the illustration. Gas is let into the balloon from the tank, the



rubber connection "a" is released, carrying the box "b" that has the releasing device, and the anchor "c," while a rope unwinds from the drum "g." The rope carries two very flexible insulated wires connected with the battery "e" and switch "d." The drum "g" has a commutator spring "f" at each end of its shaft. When the balloon is deemed to be over the shore a current from the battery is sent through the switch and releases the anchor.

Government Dirigible Nearing Completion.

The frame and motor, which have been building at the plant of the G. H. Curtiss Mfg. Co. at Hammondsport, are now entirely complete. The frame was described in the April number.

The Curtiss motor has been reduced in weight from the estimated figure given in the April number. This motor, which is now awaiting trial, has 4 cylinders and at 1,500 r. p. m. will develop 25 h. p. The weight is but 100 lbs., including carbureter, distributor and oiling devices, but does not include, of course, the battery or magneto, gasoline tank, etc. This is, without doubt, the lightest practical air-cooled motor in use anywhere. The cylinders are of cast iron; aluminum crank case; 4-throw Vanadium crank shaft; Parsons white brass bearings; mechanically operated concentric valves and auxiliary ports.

THE FIRST FLIGHTS OF THE NEW DIRIGIBLE.

A. Roy Knabenshue.

On Thursday, May 24th, after working like mad all day, I succeeded in getting ready and made a flight at 7:20 P. M., carrying Chas. K. Hamilton and Earl Hess with me. We made merely a short flight of about one mile all told and returned to the starting point.

The next day the wind blew between eighteen and twenty miles an hour all day.

At six o'clock in the morning of Saturday I made ready, and about the time I was in shape to balance up, the frame broke in two. I spent all the morning making repairs, and about half past two o'clock in the afternoon we made a start, sailing a mile west, then turning and sailing east until we were over the city at an elevation of five thousand feet, at which point I called attention to the view. We could see across Lake Erie and discern plainly the islands in the lake as well as Sandusky City. We released gas and came down to 2,000 feet when the carbureter flooded and the engine stopped. The distance from the grounds to Summit and Adams streets is about three

A. Roy Knabenshue leaving the ground after calling on Gov. Harris, Columbus, O.

miles. We sailed back to within one mile of the starting point before the engine stopped. We then settled into the ball grounds and broke up a game between Toledo and Indianapolis. I emptied the gas, rolled up the balloon and carted the apparatus out to the grounds again.

In making the landing someone had the rope and pulled down so hard that the frame came in contact with the fence and broke in two.

I had aeroplanes just back of the propeller, with thirty square feet of surface, and they were so arranged that from my position I could turn them in either direction at an angle of about forty degrees. I found no matter how I turned the planes they had the effect of keeping the nose up. As a consequence, we kept going up. I had Hess walk forward three sections beyond me, and it still kept ascending—and when we started we were heavy. So you see, the forward aeroplanes will not do.

A meeting has just been held in Brussels under the auspices of the Société Aéronautique de Belgique for the purpose of creating an "international office of aeronautical documentation." Among those present were Comte Henry de La Vaulx, M. C. van Overbergh, M. G. Lecointe, M. de La Fontaine, M. P. Otlet, M. Fernand Jacobs, M. Wouwermans, M. E. Deladrier, M. Damry, Prince Albert de Ligne, Duc d'Ursel, M. Edm. Heirman, M. Hermans, Comte Adrien van der Burch, Comte Hadelin d'Oultremont and Captain Mathieu. The Duc d'Arenberg was elected president and Comte Henry de la Vaulx and Comte H. d'Oultremont were asked to explain the aims of the new institution at the conference of the International Aeronautical Federation, which is to be held soon in London.—Paris Herald.

NEW AERO CLUBS.

Aero Club of California.

The Aero Club of California was organized at Los Angeles on May 26th. One committee was appointed to draft by-laws, another to select a location for club grounds, secure data on air currents in Southern California, etc. Several members are now building machines and it will be the aim of the club to aid in the development of the members' apparati.

Steps are to be taken to secure affiliation with the Aero Club of America.

San Antonio Aero Club.

Dr. Fred J. Fieling, an automobilist and motor boat enthusiast, has started an aero club in San Antonio, Texas.

Aero Club of the Northwest.

An aero club has been incorporated at St. Paul, Minn., the particulars being given in another part of this issue.

PITTSFIELD AERO CLUB.

The balloon recently purchased from Leo Stevens is to be christened "The Heart of the Berkshires," and it is propostd to have Mr. Glidden the guest of honor on the initial trip. A number of carrier pigeons will be taken along to be released at intervals.

BALLOON RACING FOR MAY.

Point-to-Point Contest of Aeronautique C. de France.

In this race for a predetermined objective point, six balloons were entered. It was won by M. Ravaine in the "Favori," having landed within 2 kilometers of the chosen point, situated 45.5 kilometers from the start. The nearest competitor descended 5 kilometers from the point chosen. Each one was allowed to select his own objective point.

The start was from the park at Reuil on May 3, and under the organization of the Aeronautique Club de France.

Pursuit Race of A. C. Sud Ouest.

On the 10th the A. C. Sud-Ouest organized a pursuit race, with 12 starters. The pilot balloon landed at Cesten, situated about 50 kilometers from Bordeaux, the start. The contest was won by the Malgre-Nous which landed about 27 meters from the pilot balloon. The second nearest was distant 80 meters and the third 350 meters. This is certainly an interesting phase of balloon contests.

Pursuit Race in Sweden.

On May 15th a balloon-automobile race took place at Stockholm, Sweden. One condition was that if the pursuing automobiles reached the balloons within forty minutes of the time of their landing the automobilists had won. A second was that the balloons should descend with a radius of 50 kilometers. Three balloons took part and all escaped capture by the automobilists by sailing over the straits.

Long Distance Race of Aero C. de France.

This race took place on May 16th from St. Cloud, nine balloons starting. Many Americans were present, among them: Samuel H. Valentine, Chas. J. Glidden, J. C. McCoy and Hart O. Berg, the representative in Europe of the Brothers Wright.

The rules imposed two persons in the basket for balloons of from 630 to 945 cubic meters. There was one balloon of 330 cubic meters, with one passenger, necessitating handicapping.

The race was won by the "Inch Allah," 600 cubic meters, of Francois Peyrey. The distance made was some 550 kilometers, 341.75 miles. The duration was about 23 hours. Confirmed cable has not yet been received.

Distance Race at Barcelona.

Eight balloons started, on the 18th, in this first race of the season for the Royal Aero Club of Spain. Some of the balloons met with ill luck.

Senor Montoyo, pilot of the "Quo Vadis," was caught in a gale over the Pyrenees mountains and the basket struck the rocks. Sr. Montoyo tried to open the valve but it would not work. Swinging about in the wind, the pilot was thrown out and the balloon ascended with his aide, Captain Cortades, who was enjoying his first ascent. After an hour's flight the balloon dropped with its occupant, who was considerably scratched and bruised. He finally crawled to a town. Sr. Montoyo was discovered in a helpless condition by a peasant.

Sr. Magdalena in the "Alcotan" had his guide rope seized by the peasants. Ballast was thrown out and the men dropped the rope, but in the quick ascent the balloon struck a rock and Sr. Magdalena had his arm injured.

One of the balloons caught fire on the descent from some peasants smoking. Another balloon was fired upon with revolvers or rifles.

Aero Club of France Distance Race.

Eight balloons started in the distance contest of the A. C. F. on the 24th, at St. Cloud.

International Balloon Race at London.

On May 30th the Aero Club of the United Kingdom conducted an international balloon race from Hurlingham Park, the winner of which to be the pilot who landed his balloon nearest a designated objective point determined just before the start.

Thirty-one balloons were entered: twelve British, thirteen French, three German, two Belgian and one Swiss. At the last moment a valve defect prevented one from starting.

The winner was Griffith Brewer, representing the British club, in the "Lotus" of 1,000 cubic meters, landing within 1,966 yards of the designated spot, after accomplishing a flight of miles. The "Valkyrie" of 1,698 cubic meters was second, landing 2,166 yards from winning point, C. F. Pollock pilot. The Belgian entry was third.

An object of art or $300 was offered as a first prize by "The Car Illustrated;" a cup of the value of $100, second prize, offered by Sir Thomas Lipton; another cup of $50 value offered by Sir Thomas Dewar as third prize. The fourth and fifth prizes were medals. The most successful foreign competitor will receive a special prize of $300 presented by the Royal Automobile Club.

GORDON BENNETT BALLOON RACE.

The Aero Club of France have named their representatives as follows: Jacques Faure, Henry de la Vaulx and Alfred Leblanc. Leblanc is the only one who was in the last race at St. Louis. The alternates are: Emile Carton, Louis Cappazza and Ernest Barbotte.

There were 10 contestants in the elimination race held on the 10th of May at Cologne to determine the third representative for Germany. Dr. Niemeyer was chosen after completing a trip in the Abercron from Cologne to Przibislau, in Bohemia, lasting 26 hours. The other representatives are Erbsloh, last year's winner, and Captain Abercron. All details of the preliminaries for this race have been given in "Aeronautics."

The rules have been made public by the D. L. V. Each contestant in the Gordon Bennett on Oct. 11 must deliver his balloon to the committee on the 8th. Each pilot will receive a certain number of telegraphic forms to fill out and throw overboard during the trip every half hour above the cities or villages or other accessible parts. We have already published the names of the jury and starters.

On October 10th here will be also an international contest for a fixed objective point, as well as a contest for duration. For the former balloons of all sizes will be admitted and for the endurance contest balloons must be of 500 to 2200 cubic meters capacity.

The representatives of the Aero Club of America have not been named.

Another Guaranteed Flying Machine in America.

Messrs. Triaca and Stevens have been advertising to sell a foreign aeroplane guaranteed to fly a kilometer, but now comes the announcement of the first American aeroplane to be offered for sale with a guarantee attached.

The G. H. Curtiss Mfg. Co., of Hammondsport, announce: "We are in a position to accept orders for and deliver heavier-than-air flying machines of the aeroplane type, built to carry one man, start with a 200-foot run from any reasonably smooth surface of ground and alight without damage in any open field; machine to be demonstrated in a flight of one kilometer. Deliveries can be made in 60 days. Price, $5,000."

The Seven Men in America Who Have Actually Flown in Motor Driven Aeroplanes.

Wilbur Wright	Orville Wright
A. M. Herring	Lt. Thos. Selfridge
F. W. Baldwin	G. H. Curtiss

J. A. D. McCurdy

Mr. Curtiss, so far as we can find out, has flown a greater distance—1,020 feet—on first trial than any other aviator in the world. The time was 19 seconds.

It is to be regretted that our foreign friends do not seem to realize the state of the art in America with respect to the few machines we have. From published statements they either do not realize or hesitate to admit it. How slow they were in admitting the reality of the Wright Brothers' flights—and just as we thought they had been brought to admit the facts, the recent flights of the Wrights in North Carolina revived the questions of doubt and the slight accident seemed proof positive to them of the untruthfulness of all we claim for our countrymen.

Not only was America the first, through Langley, to bring about a realization of the possibility of flight by means at hand, but also the first to produce a motor driven model and the first to produce a man-carrying machine that flew.

And are not all the machines flying abroad to-day duplicates of the Herring-Chanute-Wright model?

Dr. R. M. Randall, of the North Adams Aero Club, has purchased the "Stevens 22," of 22,000 cubic feet capacity.

May Incorporations.

Pittsfield Aero Club, Pittsfield, Mass. Incorporators: President, Luke J. Minahan, ex-Mayor Daniel England and Kelton B. Miller. The club has a capital stock of $5,000.

The Aero Club of St. Louis, which had charge of the local arrangements for the 1907 Gordon Bennett, on May 18th applied for a pro forma decree of incorporation. The stated purpose of the club is to advance and develop the "science of aeronautics and aerial research, aerial excursions, aerial races, expositions, congresses and to maintain aero garages and a clubhouse."

Aero Club of the Northwest, St. Paul, Minn. Incorporators: G. Huff Dorwood, J. Alexander Sloan, George A. Barton and Bert H. Lennon. The corporation has no capital stock and is formed to "encourage ballooning and other feats of aerial navigation and the promotion of athletics of all kinds." This is a "bran' new" club in America.

American Airship Co., Chattanooga, Tenn. Incorporators: E. L. Manning, George Bennett, Sidney Hemstreet and George E. Mattice. Stock, $10,000. Object, to manufacture airships along the lines of an invention of one of the incorporators.

Van Vranken Airship Co., of Gloversville, N. Y. Directors: Chas. Dillenbeck. Samuel Y. Stockamore and Elmer E. Van Vranken. The capital stock is $2,000. The object is to give exhibitions.

Canton Bars Ballooning.

The Canton Club, which desired to use McKinley Park for making ascensions, has been restrained by the Court from cutting down two or three trees which were in the way. Salem is anxious to have the ascensions made there and has offered a park and a sum of money as a bonus.

COMMUNICATION.

To the Editor:

On the first day of June, we, the Aero Supply Co. (with Chas. H. Tappmeyer as President and General Manager, and Louis F. Horn as Vice-President and Treasurer) will discontinue our business.

However, we intend to boost "Aeronautics" in Cincinnati and other cities.

The writer wishes here to say: "Of all cities to be slow in taking up something new, Cincinnati is something like the United States, following up Germany in aeronautical work."

Mr. Norman G. Kenan, President of the Union Gas & Electric Co., and owner of a balloon which was described in this magazine, does not intend to use the bag at all.

Let us hope that Cincinnati will wake up like the U. S. Government did before it is too late.

Aeronautically yours,

LOUIS F. HORN.

INDEX TO VOLUMES I AND II.

Volume I started with the first issue, July, 1907. Volume II started with January, 1908. Volume III starts with the July, 1908, number. On account of the great amount of miscellaneous data, club reports and news items, only the principal articles are given in this index.

December.

January.

February.

March.

April.

May.

June.